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Nurse Staffing and Quality of Patient Care

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Preface

The Agency for Healthcare Research and Quality (AHRQ), through its Evidence-Based Practice Centers (EPCs), sponsors the development of evidence reports and technology assessments to assist public- and private-sector organizations in their efforts to improve the quality of health care in the United States. The reports and assessments provide organizations with comprehensive, science-based information on common, costly medical conditions, and new health care technologies. The EPCs systematically review the relevant scientific literature on topics assigned to them by AHRQ and conduct additional analyses when appropriate prior to developing their reports and assessments.

To bring the broadest range of experts into the development of evidence reports and health technology assessments, AHRQ encourages the EPCs to form partnerships and enter into collaborations with other medical and research organizations. The EPCs work with these partner organizations to ensure that the evidence reports and technology assessments they produce will become building blocks for health care quality improvement projects throughout the Nation. The reports undergo peer review prior to their release.

AHRQ expects that the EPC evidence reports and technology assessments will inform individual health plans, providers, and purchasers as well as the health care system as a whole by providing important information to help improve health care quality.

We welcome written comments on this evidence report. They may be sent to the Task Order Officer named below at: Agency for Healthcare Research and Quality, 540 Gaither Road, Rockville, MD 20850, or by email to **epc@ahrq.gov.**

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Structured Abstract

Objectives: To assess how nurse to patient ratios and nurse work hours were associated with patient outcomes in acute care hospitals, factors that influence nurse staffing policies, and nurse staffing strategies that improved patient outcomes.

Data Sources: MEDLINE® (PubMed®), CINAHL, Cochrane Databases, EBSCO research database, BioMed Central, Federal reports, National Database of Nursing Quality Indicators, National Center for Workforce Analysis, American Nurses Association, American Academy of Nurse Practitioners, and Digital Dissertations.

Review Methods: In the absence of randomized controlled trials, observational studies were reviewed to examine the relationship between nurse staffing and outcomes. Meta-analysis tested the consistency of the association between nurse staffing and patient outcomes; classes of patient and hospital characteristics were analyzed separately.

Results: Higher registered nurse staffing was associated with less hospital-related mortality, failure to rescue, cardiac arrest, hospital acquired pneumonia, and other adverse events. The effect of increased registered nurse staffing on patients safety was strong and consistent in intensive care units and in surgical patients. Greater registered nurse hours spent on direct patient care were associated with decreased risk of hospital-related death and shorter lengths of stay. Limited evidence suggests that the higher proportion of registered nurses with BSN degrees was associated with lower mortality and failure to rescue. More overtime hours were associated with an increase in hospital related mortality, nosocomial infections, shock, and bloodstream infections. No studies directly examined the factors that influence nurse staffing policy. Few studies addressed the role of agency staff. No studies evaluated the role of internationally educated nurse staffing policies.

Conclusions: Increased nursing staffing in hospitals was associated with lower hospital-related mortality, failure to rescue, and other patient outcomes, but the association is not necessarily causal. The effect size varied with the nurse staffing measure, the reduction in relative risk was greater and more consistent across the studies, corresponding to an increased registered nurse to patient ratio but not hours and skill mix. Estimates of the size of the nursing effect must be tempered by provider characteristics including hospital commitment to high quality care not considered in most of the studies. Greater nurse staffing was associated with better outcomes in intensive care units and in surgical patients.

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Appendix and Evidence Tables for this report are provided electronically at http://www.ahrq.gov/downloads/pub/evidence/pdf/nursestaff/nursestaff.pdf **.**

Executive Summary

Introduction

A shortage of registered nurses, in combination with increased workload, has the potential to threaten quality of care.[1-3] Increasing the nurse to patient ratios has been recommended as a means to improve patient safety.[4,5] However, the cost effectiveness of increasing registered nurse (RN) staffing is controversial.[6,7]

This systematic review analyzes associations between hospital nurse staffing and patient outcomes with consideration of variables that could influence the primary association. The basic research questions were:

1. How is a specific nurse to patient ratio associated with patient outcomes (i.e., mortality; adverse drug events, nurse quality outcomes, length of stay; patient satisfaction with nurse care)? How does this association vary by patient characteristics, nurse characteristics, organizational characteristics, and nursing outcomes?
2. How is a measure of nurse work hours (hours per patient or patient day) associated with the same patient outcomes?
3. What factors influence nurse staffing policies?
4. What nurse staffing strategies are effective for improving the patient outcomes listed in question 1?
5. What gaps in research on nurse staffing and patient outcomes can be identified to address in future studies?

Questions 1, 2, and 4 are addressed in the systematic review using meta-analytic approaches. The literature associated with question 3 does not lend itself to meta-analysis.

Questions 1 and 2 address the same basic association but employ two different measures of nurse staffing. The nurse to patient ratio relies on a general ratio, which may include all nurses assigned to a unit, including non-clinical time, whereas nurse work hours look specifically at nurses involved in patient care. Even beyond this distinction, the varied ways staffing rates are calculated complicates pooling data.

Methods

Observational studies from from 1990 to 2006 from the United States and Canada were reviewed for questions 1, 2, and 4. Studies for question 3 addressed implications for nurse staffing policies. No studies primarily empirically examined a specific nurse staffing policy. Sources included journal articles, administrative reports, and dissertations.

For questions 1, 2, and 4, we present the relative risks of nurse staffing levels on various patient outcomes adjusted for measured confounding factors. Meta-analysis was used to test the consistency of the association between nurse staffing and both patient outcomes and economic outcomes (e.g., length of stay); the analyses were conducted separately for classes of patients and hospital characteristics.

Results

Of the 94 eligible studies from 96 reports, 7 percent were case-control studies; 3 percent were case-series; 44 percent were cross-sectional studies; 46 percent assessed temporality in the association between nurse staffing and patient outcomes. The overall quality of the studies averaged 38 (of a possible 50).

Patient Outcomes and Nurse Staffing Ratios

Consistent evidence from observational studies suggests that an increase in Registered Nurse (RN) to patient ratios was associated with a reduction in hospital-related mortality, failure to rescue,[1] and other nurse sensitive outcomes, as well as reduced length of stay (LOS), after adjustment for patient and provider characteristics but does not establish a causal relationship. The effect size is greater in surgical patients; ratios less than 2.5 patients per RN per shift in intensive care units (ICUs) and less than 3.5 patients per RN in surgical units were associated with the largest risk reduction based on quartiles of nurse staffing ratios.

Pooled results showed that every additional RN full time equivalent (FTE) per patient day was associated with a relative risk reduction in hospital-related mortality by 9 percent in intensive care units and 16 percent in surgical patients.[8-21] If the relationship were indeed causal, we estimate that an increase by one RN FTE per patient day would save five lives per 1,000 medical patients, and six per 1,000 surgical patients. Reducing the workload from more than six to two or less patients per RN per shift would save 25 lives per 1,000 hospitalized patients and 15 lives per 1,000 surgical patients. A further reduction from two to four patients to less than 1.5 patients per RN would save four lives per 1,000 hospitalized patients and nine lives per 1,000 surgical patients. However, staffing rates of this magnitude may not be realistic.

Every additional patient per RN per shift was associated with a 7 percent increase in relative risk of hospital acquired pneumonia,[13,14,22] a 53 percent increase in pulmonary failure,[13,14,23,24] a 45 percent increase in unplanned extubation,[13,14,23-25] and a 17 percent increase in medical complications.[13,23,24] The increase in relative risk of unplanned extubation and pulmonary failure was higher and in hospital acquired pneumonia was lower, corresponding to an increase in patients per nurse ratios. We estimated that if the relationship were causal, one additional patient per RN per shift would result in 12 additional cases of failure to rescue, six cases of pulmonary failure, and five accidental extubations per 1,000 hospitalized patients.

The associations vary by clinical settings and patient population. In ICUs, an increase by one RN FTE per patient day was associated with a consistent decrease across studies in relative risk of these patient outcomes: a 28 percent decrease of cardiopulmonary resuscitation,[13,23,24] a 51 percent decrease of unplanned extubation,[13,14,23-25] a 60 percent decrease of pulmonary failure,[13,14,23,24] and a 30 percent decrease of hospital acquired pneumonia.[13,14,22] In surgical patients, an increase of one RN FTE per patient day was associated with a consistent reduction in the relative risk of failure to rescue by 16 percent,[12,15,16,20,21] and in nosocomial bloodstream infections of 31 percent.

[1] The number of deaths in patients who developed an adverse occurrence among the number of patients who developed an adverse occurrence.

The data on other nursing personnel is limited and not replicable in the studies. LOS was shorter by 24 percent in ICUs and by 31 percent in surgical patients, corresponding to an additional RN FTE per patient day.[8,9,13,14]

Patient Outcomes and Nurse Staffing Hours

An increase in total nurse hours per patient day was associated with reduced hospital mortality, failure to rescue, and other adverse events. The death rate decreased by 1.98 percent for every additional total nurse hours per patient day (95 percent confidence interval [CI] 0.96-3 percent).[26-29] The association with RN hours per patient day did not show significant changes in mortality rates.[26-29] The relative risk of death was lower by 1 percent per 1 additional RN hour per patient day in ICUs[8,9,13,14,16] and in medical[8,10,11,17-19,26,27,30-32] and surgical patients.[9,12-16,20,26,27] The association between LPN/LVN hours per patient day and death rate was not consistent across studies.[17,20,26,27,33,34]

The association between patient outcomes and RN and LPN/LVN hours was inconsistent across the studies. Pooled analysis showed that 1 additional RN hour per patient day was associated with a reduction in relative risk of hospital acquired pneumonia by four percent,[13,14,22] pulmonary failure by 11 percent,[13,14,23,24] unplanned extubation by 9 percent in ICUs,[13,14,23-25] failure to rescue by 1 percent in surgical[12,15,16,20,26,27,30] and medical patients,[26,27,35] and deep venous thrombosis by 2 percent in medical patients.[27,35]

The LOS in hospitals was lower for additional total nursing, but not for licensed LPN/LVN and unlicensed assistive personnel (UAP) hours. The association between RN hours and LOS was not consistent across studies.

Other Attributes of Nursing

There was a significant negative correlation between the percentage of nurses with Bachelor of Science in Nursing (BSN) degrees and the incidence of deaths related to health care ($r = -0.46$, $p = 0.02$). Nurse job satisfaction and autonomy was associated with a significant reduction in the risk of death. An increase in nurse turnover increased the rate of patient falls by 0.2 percent.[36]

Staffing policies examined for this review related to the shift length, scheduling nurses to rotate to different shifts, mandatory overtime, weekend staffing, use of agency or temporary nurses, assigning nurses to nursing units other than those they are regularly assigned to work (floating), use of full-time, part-time, and internationally educated nurses (IENs), the nurse-to-patient ratio or nursing hours per patient day for nursing units, and the skill mix (licensed vs. unlicensed staff) of nursing units. Overall, few studies for any of these staffing policy variables limited drawing any conclusions. Trends in the literature suggested that rotating shifts may have negative effects on nurses' stress levels and job performance perceptions. Further, several studies indicated that nurses working longer hours may have a negative impact on patient outcomes and safety. No research provides guidance on the impact or effective use of agency/temporary staff. Research on the use and effectiveness of IENs in U.S. hospitals[37] includes qualitative exploratory studies[38,39] and descriptive studies[40-42] that examined IEN use in healthcare. No studies empirically evaluated the interaction of IEN staffing policies with organizational, nurse, or patient care unit factors.

Within the limits of scant literature, RN overtime is not associated with the location of the hospital, teaching status of the hospital, average hours in a nurses' work week, acute bed occupancy, acute average daily census, or financial margin of the hospital.[37,42-44] More overtime hours were associated with an increase in hospital-related mortality, nosocomial infections, shock, and bloodstream infections. The proportion of float nurses was positively associated with the risk of nosocomial bloodstream infections.[45-47] More contract hours was associated with an increase in LOS.[28,45,48,50]

Discussion

This review confirms previous contentions that increased nurse staffing in hospitals is associated with better care outcomes,[51] but this association has not been shown to reflect a causal relationship. Hospitals that invest in more nurses may also invest in other actions that improve quality. Magnet hospitals that are said to provide high quality care have better nurse staffing strategies.[10,52] Overall hospital commitment to a high quality of care in combination with effective nurse retention strategies leads to better patient outcomes, patient satisfaction with overall and nursing care, and nurse satisfaction with job and provided care.[10,52-59]

Two general measures of nurse staffing were studied.[60] One addressed hours of care provided by nursing staff averaging FTEs of different nurse categories at the hospital level,[11,18,19] sometimes including only productive hours worked in direct care.[28,61,62] The other relies on less precise data of total nurse staffing to patient volume derived from administrative databases[61,63-65] averaging annual nurse to patient ratios[20] at the hospital or unit level.[20] The ratio of patients per RN per shift ratio was more frequently used and provided greater evidence of the effect, but both showed generally the same trends.

The effect size varied with the nurse staffing measure. The reduction in relative risk of hospital related mortality was 16 percent for one RN FTE per patient day, and 1 percent for an additional RN hour per patient day in surgical patients. Assuming that every additional RN FTE per patient day would provide approximately 8 additional RN hours per patient day, the expected reduction should be more than observed in the studies that examined the risk of mortality in relation to nurse hours. The comparison of the effect size on patient outcomes among quartiles of patients per RN per shift ratio and nurse hours per patient day detected the same pattern; the maximum reduction in relative risk of hospital-related mortality and adverse events occurred when no more than two patients were assigned to an RN and more than 11 nurse hours were spent per 1 patient day. We did not find consistent evidence that a further increase in RN FTE per patient day ratio can provide better patient safety. The evidence of the effects of LPN/LVNs and UAP were limited and inconsistent.

It is difficult to transition between nurse hours and nurse-to-patient ratios. Nurse hours per patient day reflect average staffing across a 24-hour period and do not reflect fluctuations in patient census, scheduling patterns during different shifts (even the length of shifts varies),[9,13] and periods of the year.[66,67] They do not account for the time nurses spend in meetings, educational activities, and administrative work.

Nurse staffing could have a different effect in different hospital settings. The addition of one unit of nursing care may depend on the baseline rate. The effect of an additional nurse hour might be quite dissimilar in ICUs and typical hospital units. As shown in previous studies,[26,27] the present meta-analysis found consistent evidence that surgical patients are sensitive to nurse staffing.

The size of the nursing effect must be tempered by all the other factors not considered in most of these studies. No direct measure of other influences on outcomes is typically made. The traditional concerns about factors that affect quality of care, such as the nature of the primary medical and surgical treatment and the skill of the physician staff, are not addressed and are assumed to be evenly distributed to yield noise, but not bias. Many of the studies are performed on data collected at the hospital level over a long period of time. Adjustments for comorbidity depend on simple averages.

Skill, organization, and leadership undoubtedly play a role but are much more difficult to assess. Skill mix did not demonstrate consistent associations with tested patient outcomes in the present review. Nurse competence requirements include education, expertise, and experience[68,69] Nurse education was associated with lower mortality. The importance of nurses' professional competence and performance have been discussed with regard to developing standards of nurse performance to encourage high quality of care.[70-73]

Conclusions

Increased nurse staffing in hospitals is associated with better care outcomes, but this association is not necessarily causal. The effect size varied with the nurse staffing measure and sites of patient care (i.e., ICU, medical vs. surgical units). The size of the nursing effect must be tempered by all the other factors not considered in most of these studies.

Future Research

Future observational studies will need to take cognizance of the many other factors that can affect the outcomes of interest, especially medical care, patient characteristics, and organization of nursing units and staffs. Larger multi-center studies will be needed. More studies should be conducted at the patient level to allow for better control of issues like comorbidity. Hierarchical models that control for both institutional and nursing effects could be employed. Nonetheless, it is unlikely that all the salient variables can be addressed in any one study. Future work will need to target specific questions and collect and analyze enough information to isolate the effects of nurse staffing levels.

Evidence Report

Chapter 1. Introduction

Overview

Reports from the Institute of Medicine addressing quality of health care provided in the United States call for significant improvements at a system level to guarantee effective, efficient, evidence-based, patient-oriented, and equitable care.[74,84,85] Patient safety from injuries caused by the health care system is critical to improving quality of care and reducing health care costs.[84] Estimates suggest that 1 percent of health expenditures, or $8.8 billion, is attributable to preventable adverse events.[84] Patient safety is included in certification process of health care organizations by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO)[4] and monitored by the voluntary National Quality Forum (NQF).[5,87] The health care workforce is crucial to providing patients with high-quality care.[74] Nurses constitute 54 percent of all health care workers in the United States.[74] Because of the key role nurses play in patient safety and quality of care, the U.S. Department of Health and Human Services (DHHS) and the Agency for Healthcare Research and Quality (AHRQ) conducted several studies[51,65,89,90] to examine the association between nurse staffing and patient outcomes which showed that the work environment was a major threat to safe nursing practice in hospitals.[27] Hospital restructuring in the last two decades, in response to the advent of managed care, resulted in shorter hospitalizations of acutely ill patients to increase hospitals' efficiency and financial performance.[19] Increased patient turnover placed new stresses on nurses to provide safe patient care.[3,74] The increased workload, when 23 percent of hospitals reported 7-12 patients per nurse in most medical-surgical units, reduced nurses' trust in hospital and nursing administration as well as reducing nurse autonomy.[74] At least part of the growing nurse shortage from 6 percent in 2000 to a projected 20 percent in 2020 can be traced to nurse job dissatisfaction.[1,91]

A nurse shortage, in combination with increased workload, has the potential to threaten quality of care.[74,51] Hospitals with inadequate nurse staffing have higher rates of adverse events such as hospital acquired infection, shock, and failure to rescue.[26,27,51] Systematic reviews of the published literature show that better nurse staffing is associated with less hospital mortality and failure to rescue, and shorter lengths of stay.[51,92,93] A simulation model based on extensive research on nurse staffing estimates the need for additional nurses to achieve the quality goals set for hospital care.[6,26,27]

The design of nurse staffing studies varies. Some look specifically at individual units or nurses, while others use administrative data bases that address data at the hospital level and do not permit statistical adjustment for many potentially relevant factors. The latter designs allow for only crude associations.

Quality indicators directly related to nurse staffing have been developed.[89,95] AHRQ, the American Nurses Association (ANA), and the NQF considered failure to rescue and pressure ulcers as patient outcomes that are sensitive to nursing care, but there is less consensus on other quality measures such as hospital acquired pneumonia (AHRQ, NQF), urinary tract infection (NQF, ANA), patient falls (NQF, ANA), patient satisfaction with nursing care (ANA), ventilator associated pneumonia, and catheter associated bloodstream infections (NQF).[5,89,95]

Few studies have evaluated optimal nurse staffing ratios and hours in different clinical settings; instead, they reported the overall correlation with selected patient outcomes.[35,92,94,96-99] The effect size varied widely using different definitions of RN to patient ratio. An additional

patient per RN per shift was associated with increased relative risk of mortality by 6-7 percent in surgical patients.[15,16] An increased patient/RN ratio in the evening was associated with a 90 percent increase in relative risk of death in ICUs.[9] An increase from 1.06 to 2.66 RN FTE per patient day was associated with a relative reduction in hospital-related mortality by 9 percent.[17] Failure to rescue was reduced by 4-6 percent in surgical patients[26] when the proportion of RNs increased by 13 percent.[27] Each additional patient per RN was associated with a 5 percent increase in failure to rescue.[16] Few studies examined the effect on patient outcomes of nurse staffing strategies, such as overtime hours[100] and contract or agency nurses.[28,30,64,101]

Increasing the nurse-to-patient ratios and hours has been recommended as a means to improve patient safety.[74] Mandatory nurse-to-patient ratios and staffing plans have been established in several states[102] and proposed for all Medicare participating hospitals.[103] However, most legislative efforts related to mandatory staffing regulations cannot be supported by research that has yielded evidence-based optimal nurse-to-patient ratios or hours.[104] Moreover, the cost effectiveness of increasing the number of RN hours or RN patient ratios is controversial.[105-107] A national estimation of the cost of increasing RN staffing and the concomitant benefits from avoided deaths, reduced length of stay, and patient adverse events (urinary tract infections, hospital acquired pneumonia, shock, upper gastrointestinal bleeding, and failure to rescue) concluded that increased RN hours per patient day without increased total nursing hours could yield a net reduction in cost of care.[6] Comparing the results of different studies is complicated by the way both staffing and outcomes are measured.

The aim of this systematic review is to analyze associations between hospital nurse staffing and patient outcomes with consideration of variables that could influence the primary association. The idea for this systematic review was supported by the American Organization of Nurse Executives (AONE). AONE had representation on the Technical Expert Panel. A series of research questions was developed by AONE in conjunction with AHRQ staff as follows:

1. How is a specific nurse-to-patient ratio associated with patient outcomes?
    a. Patient outcomes: mortality; adverse drug events, nurse quality outcomes, length of stay; patient satisfaction with nurse care
    b. How does this association vary by:
        i. patient characteristics such as acuity/severity of illness, stage of treatment process; functional capacity
        ii. nurse characteristics such as nurse level of education, nursing years in practice, contract nurses, foreign-trained nurses
        iii. organizational characteristics such as type of clinical unit, duration of shift, shift rotation
        iv. nursing outcomes such as nurse satisfaction, nurse vacancy rate, nurse turnover rate, nurse retention rate
2. How is a measure of nurse work hours (hours per patient or patient day) associated with patient outcomes?
    a. Patient outcomes: mortality; adverse drug events, nurse quality outcomes, length of stay; patient satisfaction with nurse care
    b. How does this association vary by:
        i. patient characteristics such as acuity/severity of illness, stage of treatment process; functional capacity
        ii. nurse characteristics such as nurse level of education, nursing years in practice, contract nurses, foreign-trained nurses

iii. organizational characteristics such as type of clinical unit, duration of shift; shift rotation
iv. nursing outcomes such as nurse satisfaction, nurse vacancy rate, nurse turnover rate, nurse retention rate

3. What factors influence nurse staffing policies (staffing ratios, hours per patient day, skill mix, shift rotations, shift durations, overtime (mandatory and voluntary), weekend staffing, temporary nurses, full-time/part-time mix, floating to nursing units, foreign graduate nurses)?
4. What nurse staffing strategies (use of temporary nursing agencies, part-time nurses, proportion of RNs, experience mix of nursing staff, continuing nurse education, use of ancillary personnel) are effective for improving the patient outcomes listed in question 1?
5. What gaps in the body of research of nurse staffing and patient outcomes can be identified to address in future studies?

Questions 1, 2, and 4 are addressed in the systematic review using meta-analytic approaches. The literature associated with question 3 does not lend itself to meta-analysis. Rather, the third question is approached by a review of the literature. The fifth question is addressed from the results of the overall review and analysis of the studies on nurse staffing and quality.

Questions about nurse ratios and hours are basically similar and examine the same conceptual association between nurse staffing and patient outcomes but employ two different measures of nurse staffing.[108] The nurse to patient ratio relies on a general ratio, which may include all nurses assigned to a unit, including nonclinical time, whereas nurse work hours look specifically at nurses involved in patient care. Ideally, worked hours should not include other time (e.g., vacation, sick leave, conferences) that is included in the ratio. It is important to distinguish wherever possible paid hours from those actually worked.

Even within this distinction, a number of important differences exist in the way staffing ratios are calculated. Various authors used different operational definitions for the nurse to patient ratio, including:

- Number of patients cared for by one nurse per shift.
- FTE per 1,000 patient days.
- Nurse per patient day or FTE per occupied bed.

These differences provide challenges to pool data across studies.

Hours per patient day (HPD) cannot readily be used to accurately determine nurse-to-patient ratios. HPD reflect average staffing across a 24-hour period and do not reflect fluctuations in census, scheduling patterns, or absenteeism. Not all productive nursing hours are spent at the bedside. Nurses may be engaged in activities such as education, administration, and quality assurance. Thus, HPD are likely to overestimate the actual amount of bedside care, and the magnitude of the discrepancy may vary from hospital to hospital.[60,109]

Other challenges are associated with the type of nursing staff included in the nursing hours or nurse ratios. Some studies include only RNs and other studies include both RNs and LPNs/LVNs.

Outcomes research attempts to isolate the relationship between any type of treatment and outcomes by adjusting for the effects of other salient variables, such as the nature of the disease and patient characteristics. In the case of nurse staffing, the situation is somewhat different. Nurse staffing is only one component of treatment. The ideal study design would simultaneously adjust for the effects of other treatment elements, such as the specific medications and procedures given and the skills of the medical staff. Instead, most nursing studies emphasize the

effect of nursing resources, assuming that all other variables are constant and use average comorbidity scores across hospitals instead of more patient-specific measures. Indeed, individual level patient characteristics are not usually directly addressed, at least not in any detail. Some studies may be conducted on specific units that treat certain types of patients, but the disease mix and severity are generally not addressed specifically.[86] Whereas a typical medical outcomes study would include variables on patients' disease severity and comorbidities, these can best be addressed in the nurse staffing analyses conducted at patient levels, but most studies were conducted at the unit and hospital level where average values may result from various mixes of patient types.[110,111]

Given this reality, the conceptual model for the relationship between nurse staffing and outcomes (questions 1 and 2) (shown in Figure 1) focuses on those aspects of care that are generally addressed in such studies.[112-115] Two types of outcomes are proposed to be related to nurse staffing: nurse outcomes and patient outcomes. While patient outcomes are the ultimate concern, nurse outcomes can interact with nurse staffing to affect patient outcomes. Nurse characteristics can influence nurse staffing. The model includes patient factors and hospital organizational factors that may influence the effect of nurse staffing on patient outcomes. Patient outcomes will, in turn, affect LOS; greater complication rates will increase LOS. Table 1 provides definitions for the variables included in Figure 1.

The conceptual model for question 3 (Figure 2) focuses on nurse staffing policies and illustrates factors that might affect such policies, including patient care unit factors. The composition of the nursing staff, such as the extent of experience or extent of contract nursing staff, may also play a role in determining nurse staffing policies and vice versa. Hospital factors will influence nurse staffing policies; however, it is proposed that nursing organizational factors are an intervening factor. The definitions for the variables are provided in Table 1.

The conceptual model for question 4 (Figure 3) emphasizes the relationship between nurse staffing strategies and patient outcomes. Although these strategies may be influenced by nurse staffing models, this variable is not overtly considered in this analysis, and hence is shown in a dotted box. Hospital factors and patient factors can directly affect patient outcomes, as can medical care and nurse staffing levels (not shown in the model).

Figure 1. Conceptual framework of nurse staffing and patient outcomes

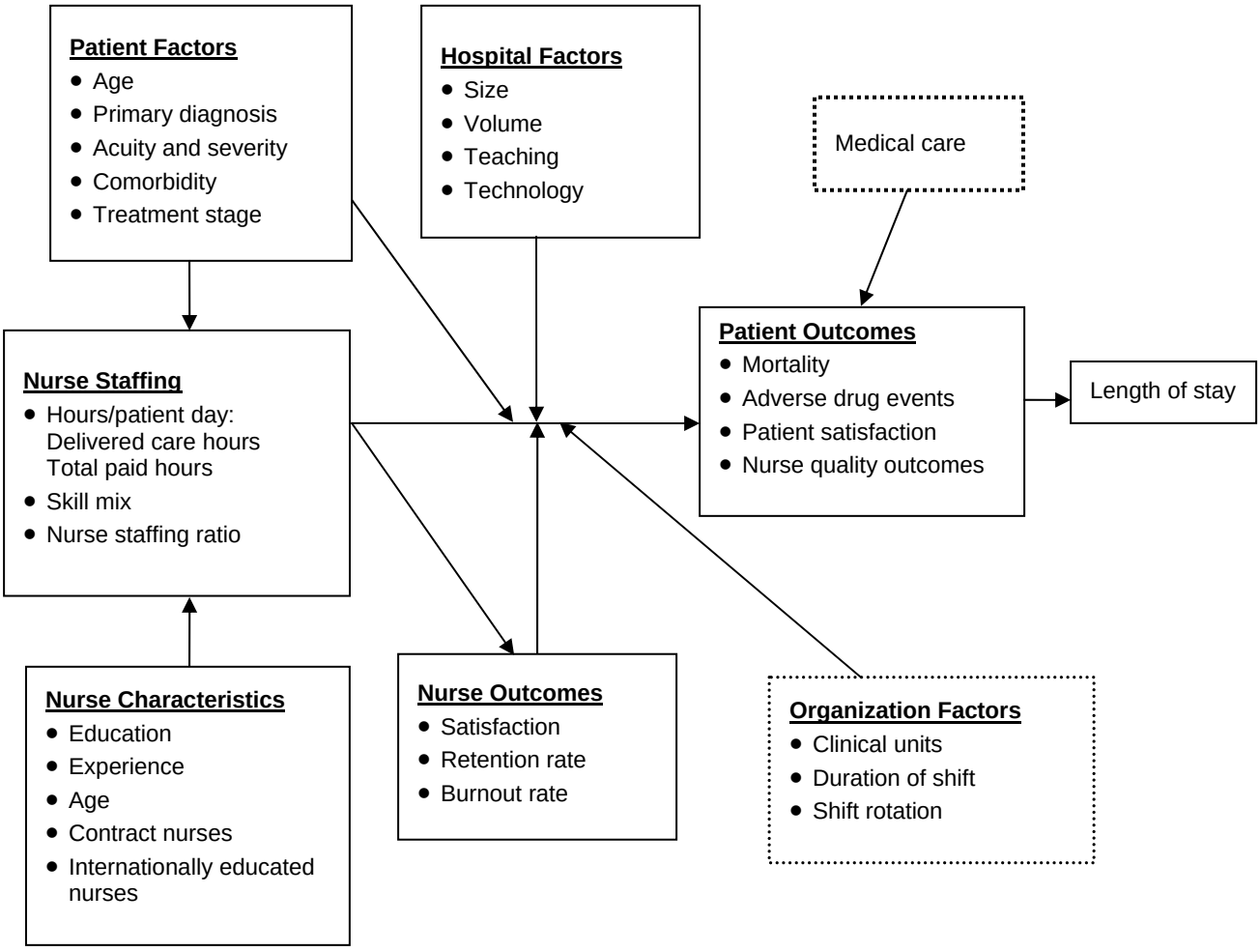


Table 1. Operational definitions

Questions 1 and 2: How is a specific nurse to patient ratio or a measure of nurse work hours associated with patient outcomes and how does this association vary by patient, nurse, and organizational characteristics?

Variable	Definition
Nurse Workforce[116]	
Registered Nurse (RN)	An individual who holds a current license to practice within the scope of professional nursing in at least one jurisdiction of the United States.
Licensed Practical/Vocational Nurse (LPN/LVN)	An individual who holds a current license to practice as a practical or vocational nurse in at least one jurisdiction of the United States.
UAP Assistive Nursing Personnel	Unlicensed individuals who assist nursing staff in the provision of basic care to clients and who work under the supervision of licensed nursing personnel. Included in, but not limited to, this category are nurses aides, nursing assistants, orderlies, attendants, personal care aides, medication technicians, and home health aides.
Nursing personnel	This term refers to the full range of nursing personnel including RNs, LPNs/LVNs and UAPs.
Nurse Staffing Measures	
Patient to nurse ratios	Number of patients cared for by one nurse, specified by job category
RN to patient ratio	Number of patients cared for by one RN
LPN to patient ratio	Number of patients cared for by one LPN
UAP to patient ratio	Number of patients cared for by one UAP
Nurse hours per patient day	Total number of productive hours worked by all nursing staff with direct care responsibilities per patient day (a patient day is the number of days any one patient stays in the hospital)
RN hours per patient day	Number of productive hours worked by RN with direct care responsibilities per patient day (a patient day is the number of days any one patient stays in the hospital)
LPN/LVN hours per patient day	Number of productive hours worked by LPN/LVN with direct care responsibilities per patient day (a patient day is the number of days any one patient stays in the hospital)
UAP hours per patient day	Number of productive hours worked by UAP with direct care responsibilities per patient day (a patient day is the number of days any one patient stays in the hospital)
RN/LPN/UAP FTEs per patient day	Number of RN/LPN/UAP FTEs per patient day (FTEs can be composed of multiple part-time or one full-time individual) This ratio has been calculated in several different ways: number of patients cared for by one nurse per shift; FTE/1,000 patient-days; nurse/patient day or FTE/occupied bed. For analytic purposes we operationalized the nurse to patient ratio as the number of patients cared by one nurse per shift and FTE/patient day (see Appendix F for calculations)
FTE	A full-time employee, or a combination of part-time employees whose combined hours are the equivalent of a full-time position, as defined by the employer
Skill mix	Proportion of productive (i.e., direct patient care related) hours worked by each skill mix category (RN, LP/VN, UAP)
Licensed nurse	RN and LP/VN
Patient Outcomes	
Mortality	
Mortality	Death from all causes (intra hospital, 30 days after discharge)
Death in low mortality Diagnosis Related Groups (DRGs)	In-hospital deaths in DRGs with less than 0.5% mortality
Adverse Drug Event	
Adverse Drug Events	An injury related to drugs caused by medical management rather than by the underlying disease or condition of the patient
Length of Stay	
Length of stay	Average length of stay: the number of patient days divided by the number of discharges for a time period
Patient Satisfaction	
Patient satisfaction with nursing care	Measure of patient perception of the hospital experience related to satisfaction with nursing care

Table 1. Operational definitions (continued)

Variable	Definition
Patient satisfaction with pain management	Patient opinion of how well nursing staff managed their pain as determined by scaled responses to a uniform series of questions designed to elicit patient views regarding specific aspects of pain management
Patient satisfaction with educational information	Patient opinion of nursing staff efforts to educate them regarding their conditions and care requirements as determined by scaled responses to a uniform series of questions designed to elicit patient views regarding specific aspects of patient education activities
Patient satisfaction with overall care	Patient opinion of care received during the hospital stay as determined by scaled responses to a uniform series of questions designed to elicit patient views regarding global aspects of care
Nurse Quality Outcomes	
Patient falls, injuries	Unplanned descent to the floor during the course of a hospital stay
Maintenance of skin integrity/pressure ulcers	Stage I-IV ulcers
Nosocomial infection rate	An infection occurring in a patient in a hospital or other healthcare facility in whom it was not present or incubating at the time of admission
Failure to rescue	The number of deaths in patients who developed an adverse occurrence; the number of patients who developed an adverse occurrence [117]
Urinary tract infection rate	Disorder involving repeated or prolonged bacterial infection of the bladder or lower urinary tract (urethra)
Surgical bleeding	Post-surgical hematoma or hemorrhage
Upper gastrointestinal bleeding	Gastrointestinal hemorrhage
Post surgical thrombosis	Deep vein thrombosis or pulmonary embolism among surgical patients
Atelectasis and pulmonary failure	Iatrogenic atelectasis and acute respiratory failure in hospitalized patients
Accidental extubation	Iatrogenic accidental extubation
Hospital-acquired pneumonia	An infection of the lungs contracted during a hospital stay
Postoperative infection	Any infection of post-surgical wounds
Cardiac arrest/shock	Cessation of cardiac mechanical activity as confirmed by the absence of signs of circulation
*Restraint prevalence (vest and limb only)	Restricting free movement of another person
Urinary catheter associated infections	Iatrogenic infection of urinary tract associated with a catheterization
Nurse Outcomes	
Staff vacancy rate	Open positions divided by total positions
Nurse satisfaction	Opinion of nurses about their job in terms of pay, reward, administration style, professional status, and interaction with colleagues
Staff turnover rate	Departures from the staff (or hires) divided by total positions
Retention rate	Proportion of nurses employed at the beginning of the year who are still employed there at the end in each participating unit
Burnout rate	Proportion of nurses who reported an excessive stress reaction to professional environment manifested by feelings of emotional and physical exhaustion coupled with a sense of frustration and failure
Patient Characteristics	
Age	Mean age in years
Primary diagnosis	Diagnosis which was a cause for hospitalization (ICD-9 codes)
Comorbidity	Coexistence of two or more disease-processes measured with weighted scales. This data can be collected on the individual patient level or an average figure can be calculated for an entire hospital.
Severity	Severity of illness classified as none or minor, moderate, or major, based on expected impact on length of stay. For surgical patients, a fourth class is added for patients having catastrophic comorbidities or complications; including chronically, critically, or terminally ill.
Stage of treatment	This applies largely to surgical patients and would be pre-op/post-op; could apply to persons undergoing some other defined intervention; could also be used to distinguish rehabilitative phase from acute treatment.
Functional capacity	Individual's maximum capacity to perform daily activities in the physical, psychological, social, and spiritual domains of life

Table 1. Operational definitions (continued)

Variable	Definition
Nurse Characteristics	
Demographics	Age and gender
Level of education	Proportion of nurses with nursing degree: Associate degree; Diploma; BSN; Master of Science (MS); Doctor of Philosophy (PhD)
Nursing experience	Experience in nursing practice in years
UAP	Unlicensed assistive personnel (not RNs or LPNs)
International Educated Nurse (IEN)	Nurses who graduated from schools of nursing in foreign countries
Contract/temporary/agency nurses	Any licensed nurse who is providing service at the facility as an employee of another entity
Organizational Characteristics	
Type of clinical units	Types of patients and services provided on a nursing unit (e.g., telemetry, medical, surgical, critical care)
Duration of shift	Length of working shift (8, 10, or 12 hour shift)
Nursing unions	Organizations that represent nurses for the purposes of collective bargaining
Hospital Factors	
Teaching status	Affiliation with a medical school
Size	Number of beds
Volume	Annual number of procedures performed in a hospital
Technology index	Weighted sum of the number of technologies for direct patient care and services available in a hospital. Availability and saturation in use of computerized physician orders entry systems, computerized nursing, and patient medical records

* Nurse process measures

Question 3: What factors influence nurse staffing policies?

Variable	Definition
Nurse Staffing Policies	
Staffing ratios	Policies regarding the number of patients cared for by one nurse specified by job category (RN, LPN/LVN, UAP)
Staffing hours per patient day	Policies regarding the total number of productive hours worked by nursing staff with direct care responsibilities on acute care units per patient day (total nursing hours, RN hours, LPN/LVN hours, UAP hours)
Staff mix	Policies regarding the proportion of productive hours worked by each skill mix category (RN, LPN/LVN, UAP)
Shift rotations	Policies regarding scheduling nursing staff to work different work shifts (days, evenings, nights) during a defined period of time (e.g., pay period; schedule period)
Shift durations	Policies regarding the length of shifts (e.g., 8 hours; 10 hours; 12 hours)
Overtime (mandatory and voluntary)	Policies requiring or permitting additional worked hours over 40 hours/week or more than 8 hours in a day or more than 80 hours in a pay period
Weekend staffing	Policies regarding the frequency of weekends worked
Temporary nurses	Policies regarding the use of temporary/agency nurses
Full-time/part-time mix	Policies regarding the number and type of nursing staff that are full time and part time
Floating to nursing units	Policies regarding when nurses can be assigned to work on nursing units other than their regularly assigned nursing unit
International Educated Nurses (IEN)	Policies regarding the hiring and use of nurses that have graduated from schools of nursing in foreign countries
Patient Care Unit Factors	
Patient classification system	Systems that classify patients according to the intensity of nursing care required
Patient flow/census fluctuations	Frequency of admissions, discharges, transfers of patients in a nursing unit or a hospital

Table 1. Operational definitions (continued)

Type of nursing unit	Types of patients and services provided in a nursing unit (e.g., telemetry, medical, surgical, pediatric, critical care)
Nursing Organization Factors	
Governance	Organizational models through which nurses control their practice as well as influence administrative areas
Management/leadership style	Degree to which nurses in management and leadership positions make themselves visible and accessible to nursing staff, seek, value, and incorporate feedback from nursing staff, and communicate with nursing staff
Hospital Factors	
Type	Teaching, non teaching, rural, urban
Ownership	Proprietary, government/public, and not-for-profit
Technology use	Electronic medical record
Risk management	Degree to which the organization addresses the prevention of adverse events
Unionization	Percent or proportion of nurses who are members of a collective bargaining unit
Nurse Factors	
Experience in nursing	Years working as a licensed nurse or UAP
Age	Age in years
Education	Proportion of nurses by highest level of education in nursing: practical nursing, associate degree, diploma, baccalaureate, masters, doctorate

Question 4: What nurse staffing strategies are effective for improving outcomes?

Variable	Definition
Nurse Staffing Models	
Patient focused care	RNs serve as care managers managing unlicensed assistive personnel in expanded roles (drawing blood, performing EKGs, and performing certain assessment activities)
Primary nursing	RN accountable for care of patient from admission to discharge; coordinates all care; provides direct care for patient
Total patient care	RN assumes total responsibility for care of the patient during the time the nurse is on duty
Team nursing	RN is a team leader and LPNs and UAPs provide patient care as directed by the RN team leader
Functional nursing	Nursing staff are assigned specific tasks (e.g., treatments, medications, patient hygiene care) according to their skill and education
Staffing Strategies	
Use of temporary nursing agencies	Use of nursing personnel that are employed by an organization that supplies nursing staff
Use of part-time nurses	Proportion of nurses (RN and LPN) working part time (less than 8 hours per shift or less than 40 hours per week)
Proportion of RNs	Proportion of RNs among total hospital and total nursing personnel
Experience mix of nursing staff	Proportion of nursing staff (by type) according to their years of experience
Continuing nurse education	Professional development process after the completion of the pre-registration nurse education program. It consists of planned learning experiences which are designed to augment the knowledge, skills, and attitudes of registered nurses to improve quality of care and patient outcomes.
Use of ancillary personnel	Aides, clerical staff, phlebotomists

Patient outcome measures used for questions 1 and 2 will be used for question 4 as well.

Figure 2. Factors affecting nurse staffing policies

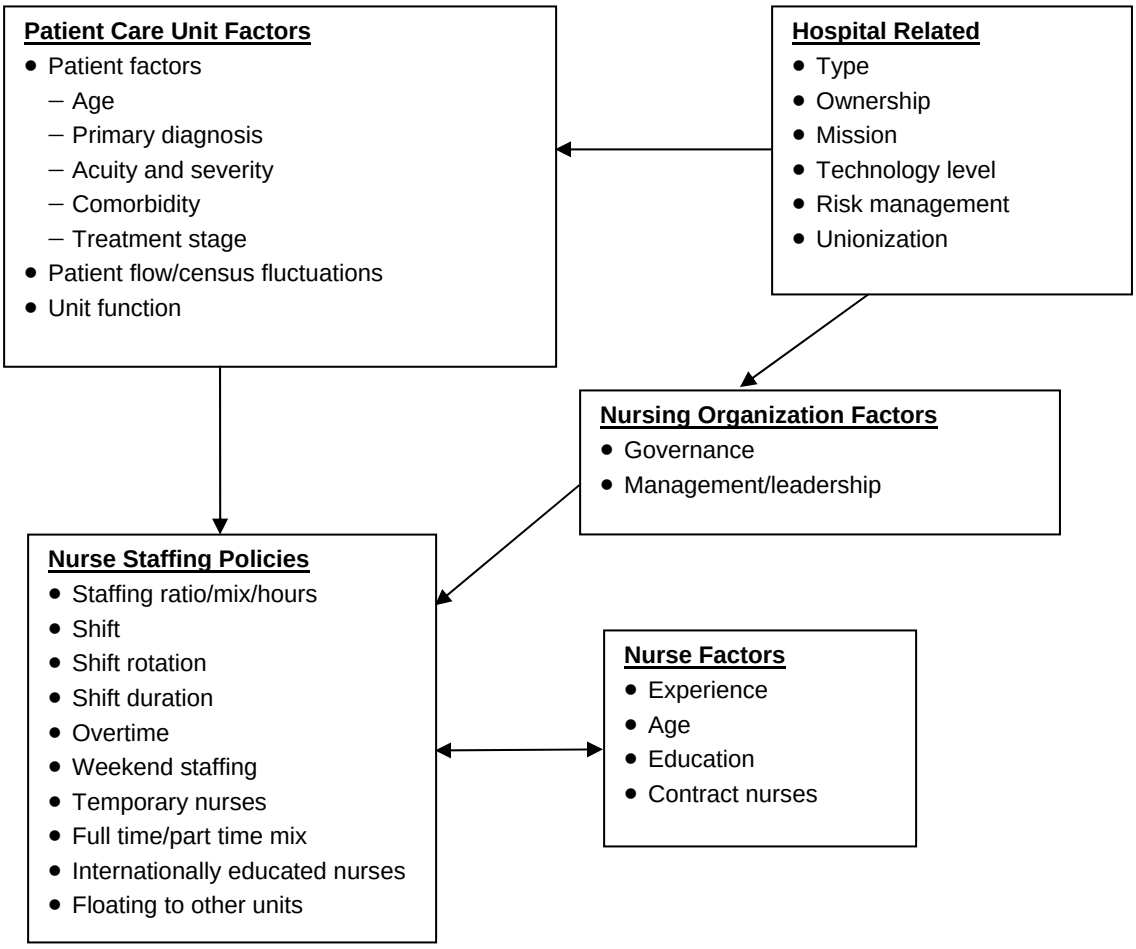
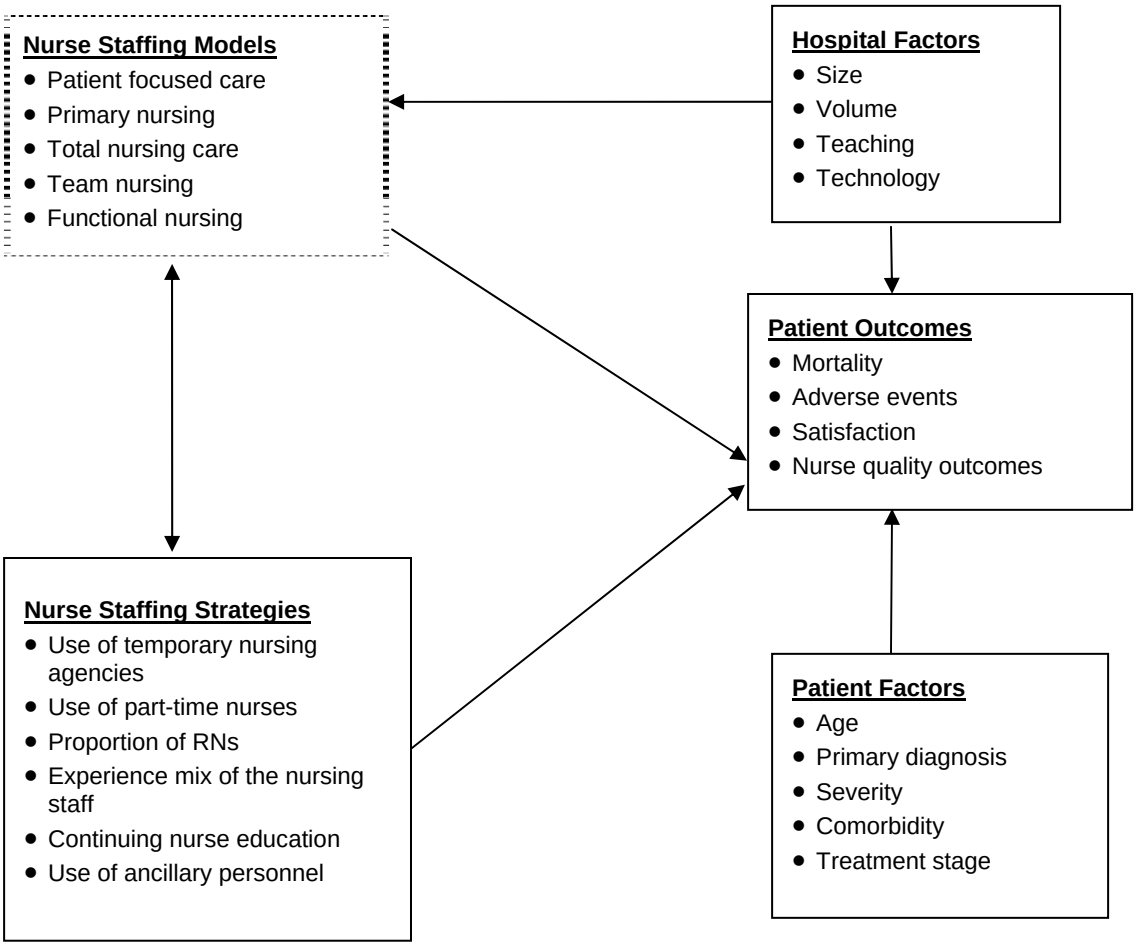


Figure 3. Nurse staffing strategies and patient outcomes



Chapter 2. Methods

Literature Search Strategy and Eligibility Criteria

Search Strategy

Studies were sought from a wide variety of sources, including MEDLINE®, PubMed®, CINAHL, Cochrane databases, EBSCO research database, BioMed Central, federal reports, National Database of Nursing Quality Indicators, National Center for Health Workforce Analysis, American Nurses Association, American Academy of Nurse Practitioners, and Digital Dissertations. The search strategies for the four research questions are described in Appendix A*. The same eligibility criteria, selection of studies, and analysis of studies were used to examine the association between nurse staffing and strategies and patient outcomes. The approach was different to identify studies that examined factors that influence nurse staffing policies. As noted earlier, the question about policies was not appropriate for meta-analysis. Excluded references are shown in Appendix B. All work was conducted under the guidance of a Technical Expert Panel (TEP). Members are identified in Appendix C. The data abstraction forms are shown in Appendix D.

Eligibility

Two investigators independently decided on the eligibility of the studies.[118] We reviewed abstracts to exclude studies with ineligible target populations conducted in countries other than the United States and Canada and in long-term nursing facilities. Then we confirmed the eligibility status of the study designs, excluding secondary data analysis, reviews, letters, comments, legal cases, and editorials. The full texts of the original epidemiologic studies were examined to define eligible independent variables (nurse staffing and strategies) and eligible outcomes. Then we excluded studies that did not test the associative hypotheses and did not provide adequate information on tested hypotheses (e.g., least square means, relative risk).

Inclusion criteria were applied to select articles for full review. Studies needed to meet one of the following criteria for questions 1, 2, and 4:

- Retrospective observational cohort studies and retrospective cross sectional comparisons
- Administrative cross-sectional survey and analyses;
- Randomized controlled trials with random allocation of subjects to intervention and control groups
- Controlled not randomized clinical trials[2]
- The studies must evaluate the associations between nurse staffing and patient outcomes/nurse quality measures among eligible target populations (patients hospitalized in acute care hospitals in the United States and Canada) and published after 1990 except conducted in 1982-1989 but frequently cited in recent publications
- Ecologic studies on correlations between nurse staffing and patients outcomes
- Cost-effectiveness analysis of nurse staffing

[1] The literature in this area contained no randomized controlled trials or even non-randomized trials.

[*] Appendixes and Evidence Tables for this report are provided electronically at http://www.ahrq.gov/clinic/tp/nursesttp.htm

Studies were selected for question 3 if the study provided implications for nurse staffing policies. No studies had as a primary purpose to empirically examine a specific nurse staffing policy.

The exclusion criteria included the following:

- Studies published before 1990
- Studies conducted in countries other than United States and Canada and not published in the English language
- Studies with target population as outpatients and patients in long-term care facilities
- Studies with no information relevant to nurse staffing policies and strategies
- Studies that examined the contributions of advance practice nurses (nurse practitioners, nurse clinicians, certified nurse midwives, nurse anesthetists)
- Studies that evaluated the association between nurse staffing and ineligible outcomes (questions 1, 2, and 4)
- Administrative reports and single hospital studies with no control comparisons that do not test an associative hypothesis (questions 1, 2, and 4)

The assessment of the studies' quality was based on "Systems to Rate the Strength of Scientific Evidence."[119] For questions 1, 2, and 4 we grouped all criteria into ten dimensions with scores for each aspect assigned a value from 0 to 5 (highest) for a total possible score of 50 for the statistical analysis of the studies' quality (Appendix E).

Given the absence of RCTs, the level of evidence for all studies was estimated using a subset of the U.S. Preventive Services Task Force[120] criteria noted below:

II-2A: Well-designed cohort (prospective) study with concurrent controls

II-2B: Well-designed cohort (prospective) study with historical controls

II-2C: Well-designed cohort (retrospective) study with concurrent controls

II-3: Well-designed case controlled (retrospective) study

III: Large differences from comparisons between times and/or places with or without interventions (cross-sectional comparisons).

For question 3, an evidence table was developed for each of the nurse staffing variables identifying the purpose of the study, sample, design, independent and dependent variables, and findings.

For questions 1, 2, and 4, descriptive statistics, correlation and regression coefficients, and F and T tests for treatment differences were used to assess reported outliers, variances, and skewness in the data.[121,122] Baseline data were compared in different studies to test the differences in the target population and unusual patterns in the data.[123,124] Standard errors, regression coefficients, and 95 percent CI were calculated from reported means, standard deviations, and sample size.[121,122] The protocol for the meta-analyses was created according to the recommendations for Meta-analysis Of Observational Studies in Epidemiology (MOOSE).[125]

We used the Trim and Fill method[126] to detect publication bias defined as the tendency to publish positive results and to predict the association when all conducted (published and unpublished) studies are analyzed. Time trends in positive results were assessed with interaction models with time of the events as continuous variables.

The evaluations of the studies and the data extraction were performed manually and independently by two researchers. The principal investigators of some studies were contacted to assess the additional and missing information when necessary. Errors in the data extractions were assessed by a comparison with the established ranges for each variable and by a comparison of the data charts with the original articles. Any discrepancies were detected and discussed.

Patient populations were classified as surgical, medical, and combined samples.[26,27] Adjustments for patient age, race, gender, comorbidities, socioeconomic status, provider characteristics, and clustering of patients and providers were extracted from the studies.[127]

Data Synthesis

For questions 1, 2, and 4, the results of individual studies were summarized in an evidence table with relation to the sample size and 95 percent CI in outcomes. Weighted by the number of patients and hospitals, odds ratios and 95 percent CIs were calculated with fixed and random effects models.[128]

We report the nurse to patient ratios as they were used by individual authors; but we have also created two standardized rates for purposes of comparison:

1. The number of patients cared by one nurse per shift[3]
2. RN FTE per patient day

FTE per occupied bed ratios were calculated based on FTE per mean annual number of occupied bed days (patient days). Therefore, we conducted separated analyses and report the results:

- With definitions the authors used
- Corresponding to an increase by one RN FTE per patient day
- In categories of patients per RN per shift in ICUs, and with surgical and medical patients.[27]

Different methods have been used to estimate nurse hours per patient day from FTEs. Some investigators assume a 40 hour week and 52 working weeks per year (2,080 hours per year). Others use more conservative estimates (e.g., 37.5 hours per week for 48 weeks = 1,800 hours per year).[129] In our conversions, we used the latter estimate (Appendix F).

We estimated that:

- Nurse hours per patient day = (FTE * 40)/patient days[130]
- One nurse per patient day = 8 working hours per patient day[129]
- Then the patient per nurse ratio = 24 hours/nurse hours per patient day[130]

We made the following assumptions:

- 37.5 hour work week on average
- 48 working weeks per year (4 weeks vacation, holidays, sick time);
- All FTEs are full-time nurses with the same shift distribution (assume three 8-hour shifts)
- The length of shift does not modify the association between nurse staffing and patient outcomes
- Patient density is the same over the year

The same estimation was used for each nurse job category—RN, LPN/LVN, and UAP.

Meta-analysis was used to assess the consistency of the association between nurse staffing and patient outcomes and improvement in economic outcomes including LOS. The analyses were conducted separately for classes of patient and hospital characteristics. Assumptions underlying meta-analysis included valid measurements of nurse staffing and patient outcomes, similarity in target populations, and similarity in reported and not reported variance.

Sub-analyses were conducted to test whether the direction and strength of the association was independent of study design and financial support.[127] Consistency in the results was tested comparing the direction and strength of the association in models with nurse staffing variables as continuous (overall trend) and categorical, in studies reporting outcome rates and adjusted

[3] We assume an 8-hour shift.

relative risk, and with goodness of fit tests. Chi squared tests were used to assess heterogeneity in study results.[131,132] Significant heterogeneity means the effects of nurse staffing on patient outcomes were not consistent in the studies (not replicable results). The hypotheses of the associations between outcomes and nurse staffing variables were tested with random effects models (random intercept for each study) to incorporate between variability in the studies and to provide valid pooled estimates weighted by sample size. Individual studies were analyzed with simple linear regression to find slopes for each study when possible. Meta-analysis was used to estimate pooled regression coefficients: changes in outcomes corresponding to incremental changes by one unit in nurse staffing. The analytic framework and algorithms for the meta-analysis are shown in Appendix F**.**

Meta-regression models analyzed possible interactions with the year of publication, analytic units, hospital units, adjustment for confounding factors, and patient population.[132,133] The calculations were performed using the following software: STATA,[134,135] and SAS 9.2 Proc Mixed.[136] To ascertain whether the relationships were linear, two different forms of staffing variables were tested: continuous and categorical, where the latter was arranged in quartiles. When authors reported outcome rates and relative risks grouped by different exposure cut points and reference, we assigned exposure levels as the mean or median of nurse staffing variables, assuming a normal distribution. We also transformed nurse staffing levels into a risk estimate per unit of exposure and assigned an exposure value to each categorical group, assuming a specific parametric distribution for the exposure in the population.[137] This method can test a linear dose-response relation and assess the nonlinearity of the dose-response relation.

The research question examining factors that influence nurse staffing policies (question 3) involved the identification of studies that included one or more of the nurse staffing variables. The studies were summarized in evidence tables followed by a synthesis of the studies for each staffing policy.

Chapter 3. Results

Figure 4 traces the flow of our literature search for questions 1, 2, and 4. Of the 2,858 potentially relevant references from eight databases identified, we excluded 97 percent of the studies; 2 percent were case reports; 20 percent – comments and success stories; 2 percent – legal cases; 2 percent – editorials and expert opinions; 5 percent – letters, guidelines, interview, and news that reprinted the results of the original reports; and 4 percent – reviews and secondary data analyses, and one web survey. We excluded 21 percent of the studies that lacked relevant components; 6 percent without eligible outcomes, 30 percent without eligible target populations, and 21 percent that did not test associative hypotheses between nurse staffing and patient outcomes. Among 101 potentially relevant randomized controlled clinical trials, none was eligible; 56 tested ineligible interventions; five reported ineligible outcomes; 38 were conducted in European countries or included nurses in long-term nursing facilities.

We identified 94 eligible studies presented in 96 reports; 7 percent were case control studies; 3 percent were case series; 44 percent were cross sectional studies; 46 percent assessed temporality in the association between nurse staffing and patient outcomes.

The overall quality of the studies averaged 38 (where the maximum possible score was 50) (Table 2). Three studies received <50 percent of the maximum quality score; 24 studies had <66 percent, and 21 studies had >88 percent of the maximum quality score. Within this score, the mean external validity was 3.5 ± 1 (70 percent of the maximum score) with 67 percent for the sampling of the study populations; random sampling was reported in 16 studies (17 percent), and sampling bias was assessed in 15 studies (16 percent). More than 9 percent of the sampled analytic units were excluded from 27 studies. Single hospital studies constituted 25 percent of all eligible studies (23 reports). Geographical locations of eligible hospitals were reported in 49 studies (52 percent). The investigators generally obtained national and state administrative databases to identify eligible populations.

The mean score for adjustment for assessed confounding factors as a characteristic of internal validity was 2.9 ± 1.6 (only 58 percent of the possible maximum score); 17 studies did not provide information on adjustment for confounding factors. Few studies reported the validation to measure nurse staffing variables (11 studies, 12 percent) and patient outcomes (22 studies, 23 percent). Medical records were obtained to measure patient outcomes in 27 studies (29 percent); 58 studies (62 percent) used administrative databases. Thirty-two studies used hospitals as analytic units (34 percent); 43 studies (46 percent) used patients; and 13 studies (17 percent) used hospital units. Medicare populations were used in 11 studies (12 percent).

The majority of the studies were conducted in the United States (84 studies) with no significant differences in quality (80 percent in Canadian studies vs. 76 percent in American, $p = 0.44$). The studies supported by national grants had higher quality (80 percent of maximum) compared with unknown sponsorship (73 percent, $p = 0.02$). The quality scores of the studies did not change over the decades ($p = 0.15$). The test for publication bias was not valid due to a small number of studies for each association and heterogeneity in the results.

Association Between Nursing Hours and Ratios and Patient Outcomes

Distribution of Nurse Staffing Hours and Ratios

Many investigators obtained administrative databases on national, state, and hospital levels. Some relied on surveys of nurse managers to measure nurse staffing variables (Appendix G*, Table G1). The means and distribution of nursing hours and ratios are presented in Table 3. Total nursing hours per patient day were measured in 36 studies (38 percent), RN hours in 27 studies (29 percent), LPN/LVN hours in 12 studies (13 percent), licensed nurse hours in three studies, and UAP hours in three studies. Ratios of patients per RN and RN FTE per patient day were examined in 36 studies (38 percent), LPN/LVN ratios in eight studies (9 percent), licensed nurse ratios in three studies, and UAP ratios in nine studies (10 percent). The distribution of nurse staffing variables in eligible published studies was comparable with that published in literature with higher LPN/LVN hours per patient days in medical patients.[27,138]

Question 1. Association Between Nurse to Patient Ratios and Hospital-Related Mortality

We identified 26 studies that examined the association between hospital related mortality and nursing hours or ratios (Appendix G, Table G2).[8-21,23,26-28,30,32-34,139-141] The authors defined hospital related mortality as in-hospital mortality[8,9,13,14,18-20,26,27,30,33,34] or death within 30 days after hospital admission.[10,11,15-17,21,32,140] For analysis purposes we combined in-hospital mortality and 30-day mortality. Estimating hospital-related mortality based only on in-hospital deaths may be influenced by hospital discharge practices[142] and could result in lower in-hospital mortality rates that are independent of the quality or effectiveness of hospital care.

One study[143] compared the relationship of in-hospital and 30-day mortality rates in 13,834 patients with congestive heart failure who were admitted to 30 hospitals and found a significant correlation in standardized mortality ratios sensitive to individual hospital characteristics. The association with nurse ratios or hours was presented as changes in crude death rates and adjusted relative risk of death corresponding to one unit increase in nurse staffing or in nurse staffing categories defined by authors.

Nurses Ratios and Mortality

The pooled results, overall and within ICUs and surgical units, weighted by the sample size (number of hospitals and patients) showed a reduction in the crude death rate in association with increase RN staffing. An additional RN FTE per patient day was associated with a 1.24 percent reduction in death rate.[12,17,34] The same tendency was shown corresponding to one additional RN per 1,000 patient days.[33] In contrast, one additional patient per RN per shift was associated with an increase in hospital-related mortality by 0.1 percent[13,16,23] (Table 4).

* Appendixes and Evidence Tables for this report are provided electronically at http://www.ahrq.gov/clinic/tp/nursesttp.htm.

A pooled analysis showed that an increase by one RN FTE per patient day was associated with a 1.2 percent reduction in mortality rates in all studies.[12,13,16,17,20,23,34] The association was consistent in ICUs.[13,16,23]

A nonlinear quadratic association between patients per RN per shift and the death rate was noted. The rates increased from 1 to 5 patients per RN per shift (p for heterogeneity <0.001). The nadir for the relative risk of death was 1.5 RN FTE per patient day (p for heterogeneity 0.002). Table 5 shows both the effects of increasing staff with the authors' definitions of nurse to patient ratios by one RN FTE per patient day and the relative effects in quartiles of patients per RN per shift distribution in different clinical settings. More RN staffing was consistently associated with a reduction in adjusted relative risk of hospital-related mortality. An increase by one RN FTE per patient day was associated with a smaller but consistent across the studies' reduction in mortality by 6 percent (RR 0.94, 95 percent CI 0.93-0.95).[8,10-12,17,20]

The relative risk of hospital related death was associated with a decrease by 8 percent corresponding to an additional one RN FTE per patient day in pooled analysis.[8-21] For studies analyzed at the hospital level, the associated decrease in relative risk was 4 percent (95 percent CI 0.94-0.98).[11,12,18-20] For those analyzed at the patient level, it was 8 percent (95 percent CI 0.89-0.95).[9,10,13-17,21] Among medical patients it was 6 percent (95 percent CI 0.94-0.95)[8,10,11,17-19] and among surgical patients, 16 percent (95 percent CI 0.8-0.89)[9,12-16,20,21] (Figure 5). In contrast, an additional patient per RN per shift was associated with an 8 percent increase in mortality risk (RR 1.08; 95 percent CI 1.07-1.09).[9,13-16,21]

We calculated the relative risk of death in quartiles of patients per RN per shift and found a consistently significant reduction in the relative risk of hospital-related mortality corresponding to a reduced number of patients assigned to an RN (Table 5 and Figure 6). The effect was larger in surgical patients. The pooled relative risk was 0.76 times less when one RN was assigned to less than two patients compared with four to six patients, and 0.62 times less compared with more than six patients per RN. The reduction was 6 percent in ICUs when one RN was assigned to less than three patients vs. three to four patients.

If the relationship between staffing and outcomes was causal, we estimate that an increase by one RN FTE per patient day would save five lives per 1,000 hospitalized patients, five lives per 1,000 medical patients, and six per 1,000 surgical patients (Table 6). Reducing the workload from more than six to two to four patients per RN per shift would save 23 lives per 1,000 hospitalized patients. A reduction from three to four to less than three patients per RN per shift in ICUs would save three lives per 1,000 hospitalized patients. The decrease from more than six to 2-3.5 surgical patients per RN per shift would save 13 lives, and a further reduction to less than two patients per RN would result in 15 avoided deaths per 1,000 hospitalized surgical patients.

Extrapolating these relationships even further to examine the public health impact of RNs per patient ratio, we found that an increase of one RN FTE per patient day would reduce hospital mortality by 8 percent. The effect varies from 4 percent at a hospital level analysis to 8 percent at a patient level analysis. The reduction in a workload from 3 to 4 to less than three patients per RN would eliminate 6 percent of deaths in ICUs. The proportion of deaths attributable to patients per RN per shift ratio is larger in surgical patients; 38 percent of deaths were linked to poorer nurse staffing in hospitals with more than six patients per RN compared to less than two patients in surgical units.

To compare the results from individual studies, we calculated changes in death rates and relative risk of death corresponding to an increase by one unit in nurse staffing (Appendix G

Table G2 and Table 7). The majority of the studies (57 percent) reported a significant reduction in risk of death corresponding to an increase in RN staffing, but the effect size differed in studies that used medical records in contrast to administrative databases to measure mortality among hospital units and patient populations (Appendix G Tables G3 and G4). We calculated from the individual studies[10,15,16] that about 6-7 percent of deaths were attributable to an increase in patients per RN per shift (Table 8). The observed death rate could be reduced by 9-10 percent when increasing by one RN FTE per 1,000 patient days.[18,19] A decrease in the nurse to patient ratio in the evening was associated with a 90 percent increase in mortality; 47 percent of deaths in patients after abdominal aortic surgery was attributable to nurse staffing in these hospitals.[9] Ten percent of avoided deaths in patients with acute myocardial infarction was attributable to an increase from 1.06 to 2.7 RN FTE per patient day.[17] In patients hospitalized with bladder carcinoma, 51 percent of deaths was associated with a reduction from 3.1 to 1.4 RNs per occupied bed ratio.[20]

Three studies that examined the effect of the LPN/LVN per patient day ratio[17,34,94] reported inconsistent changes in the death rate. A nonlinear association between patients per LPN/LVN per shift ratio and relative risk of hospital-related mortality was observed in medical patients with the lowest risk corresponding to 9-12 patients per LPN/LVN (p for quadratic association 0.0003). The death rate was lowest when one UAP was assigned to 7-12 medical patients (p for quadratic association 0.0029).One study reported a significant increase in the death rate of 1.9 percent (95 percent CI 1.5-2.5 percent) for every additional patient per UAP (p = <.0001).[94]

We found some evidence that nurse education and experience are associated with hospital-related mortality. Using state level administrative reports on nurse distribution in the United States[1,144] and the CDC data[148] on fatal injuries related to health care, we found a significant negative correlation between the percentage of nurses with BSN degrees and the incidence of deaths related to health care (r = -0.46, p = 0.02) (Table 9).One study in surgical patients[16] reported a 5 percent reduction in mortality with each 10 percent increase in nurses with BSN degrees (Table 10). Hospitals with a higher proportion of nurses with BSN degrees (36 percent vs.11 percent) had 19-34 percent less mortality.[101] Nursing experience did not impact hospital-related mortality.[16,140] Nurse job satisfaction was associated with a significant reduction in the risk of death;[101] an increase by 17 percent in nurses reporting they were satisfied or very satisfied with their job was associated with a 15 percent decrease in mortality. Hospitals where nurses had the freedom to make important patient care and work decisions experienced 21 percent lower mortality.[101] Nurse manager support was negatively correlated with mortality (r = 0.3) in one single hospital study in 21 hospital units.[145]

Association Between Nurse to Patient Ratios and Nurse Sensitive Patient Outcomes

Authors used different definitions of nurse sensitive patient outcomes, including a combination of medical[13,14,23] and surgical[13,23] complications related to health care, failure to rescue,[15,16,20,21,35] and secondary diagnoses of patient nosocomial infections, falls, pressure ulcers, pulmonary and cardiac failure, and thrombo-embolic complications related to health care (Appendix G, Table G5). The associations were presented as differences in the rates or relative risk of outcomes by various categories of nurse staffing.

Patient outcomes corresponding to an increase in registered nurse per patient ratio. Pooled analysis of crude rates (Table 11) showed inconsistent results on patient outcomes. An increase by one patient per RN per shift was associated with a significant increase in failure to rescue by 0.35 percent,[16] and pulmonary failure by 6.54 percent.[13,14,23] An increase by one RN FTE per patient day was association with 0.03 percent decrease in atelectasis and pulmonary failure.[13,14,23,33,35] The effect was larger in surgical patients in ICUs with a 12 percent reduction in pulmonary failure.[13,14,23] However, a 0.71 percent reduction in urinary tract infection was associated with one additional patient per RN per shift[22,146] and a 5 percent increase corresponded to one RN FTE per patient day.[22,23,146] Studies that defined RN FTE per patient day ratio did not show significant changes in outcomes. One unpublished dissertation[33] reported an increase in falls, nosocomial infections, and pressure ulcers corresponding to an increase of one RN FTE per 1,000 patient days (Appendix G, Table G6).

In contrast with the analyses of outcomes rates, pooled analysis of adjusted relative risks (Table 12) detected a significant, generally consistent reduction in patient outcomes corresponding to an increase in RN staffing. An additional patient per RN per shift was associated with a 1.07 times higher risk of hospital acquired pneumonia (95 percent CI 1.03-1.11),[13,14,22] a 1.08 times higher risk of failure to rescue (95 percent CI 1.07-1.09),[15,16,21] and a 1.16 times higher risk of cardiac arrest (95 percent CI 1.05-1.29).[13,23,24] The risk of pulmonary failure was greater by 53 percent and the risk of unplanned extubation by 45 percent corresponding to an additional patient per RN per shift.[13,14,23-25] We estimated that an increase by one RN FTE per patient day in ICUs was associated with a consistent reduction in the relative risk of hospital acquired pneumonia by 30 percent,[13,14,22] pulmonary failure by 60 percent,[13,14,23,24] unplanned extubation by 51 percent,[13,14,23-25] and cardiac arrest by 28 percent.[13,14,24] An increase by one RN FTE per patient day in surgical patients was associated with 0.84 times less risk of failure to rescue[12,15,16,20,21] and 0.64 times less risk of nosocomial bloodstream infections.[13,22-24,147]

In individual studies, the largest decrease in the relative risk of central line associated bloodstream infection was seen in surgical patients in ICUs corresponding to increased nurse to patient ratio.[147] Surgical patients also experienced greater increase in the risk of failure to rescue (p for interaction 0.04) in a multi-hospital study[15] by 7 percent corresponding to every additional patient per RN (RR 1.07, 95 percent CI 1.02-1.11).

We found nonlinear quadratic associations between the RN FTE per patient day ratio and unplanned extubation in ICUs with the nadir at 1.9 RN FTE per patient day (p for quadratic association 0.04). In surgical patients, the ranges of RN FTE per patient day at 0.9-2.2 were associated with the lowest relative risk of hospital acquired pneumonia (p for quadratic association 0.02) and the ranges of 1.5-2 RN FTE per patient day were associated with the lowest risk of failure to rescue (p for quadratic association 0.005).

Patient outcomes corresponding to an increase by one patient per LPN/LVN per shift (Appendix G, Table G7). The data on LPNs/LVNs is varied and inconclusive. One large study in 1,477 hospitals[94] examined the association between LPN/LVN per patient ratios and patient outcomes (Figure 7) and reported that one additional patient per LPN/LVN per shift increased the rates of surgical wound infection by 0.02 percent (95 percent CI 0.01-0. 05), pulmonary failure by 0.04 percent (95 percent CI 0.02-0.05), pneumonia by 0.06 percent (95 percent CI 0.04-0.07), patient falls by 0.03 percent (95 percent CI 0.02-0.04), and cardiac arrest by 0.03 percent (95 percent CI 0.02-0.04). One study[18] reported a nonsignificant risk of pneumonia and

urinary tract infections (UTI) corresponding to an increase by one LPN/LVN FTE per patient day.

Few studies examined the association between patient outcomes and licensed nurse ratio defining licensed nurses as RN or LPN/LVN. Nonsignificant changes in the rates of pressure ulcers were reported in one study[64] and in patient falls in two studies[64,65] corresponding to an additional patient per licensed nurse.

Patient outcomes corresponding to an increase by one patient per UAP per shift. An examination of the association between UAP per patient ratio and patient outcomes (Figure 8) showed that one additional patient per UAP was associated with an increase in the rate of surgical wound infection by 0.01 percent (95 percent CI 0.009-0.03), cardiac arrest by 0.04 percent (95 percent CI 0.02-0.05), and pressure and decubitus ulcers by 0.5 percent (95 percent CI 0.2-0.8). Consistently across three studies[33,61,75] an increase in the rate of patient falls by 0.03 percent (95 percent CI 0.02-0.04) (heterogeneity not significant [NS]) was detected corresponding to an increase by one patient per UAP per shift (Appendix G, Table G8).

Length of stay corresponding to an increase in nurse staffing ratios. The associations between nurse staffing ratios and LOS in hospitals and in hospital units were reported in days and in relative changes in days adjusted for patients and provider characteristics (Appendix G, Table G9). Pooled analysis[9,13,14,23,33,35,146,147,150] (Table 13) detected a reduction in length of stay by 0.25 days corresponding to an additional RN FTE per patient day (p value for heterogeneity <0.05). The reduction by 0.25 days per one RN FTE per patient day was significant but not consistent in medical patients. One study[94] reported that every additional LPN/LVN FTE per 1,000 patient days increased the length of stay by 1.8 days (95 percent CI 1.35-2.25). Random changes in LOS in relation to UAP workload were reported in one study.[33]

Pooled analysis of adjusted relative changes in LOS (Figure 9) detected a 20 percent increase in LOS corresponding to one additional patient per RN per shift (95 percent CI 1.08-1.35, heterogeneity NS). The significant reduction in LOS was 31 percent in surgical patients (95 percent CI 0.55-0.86)[9,13,14] and 24 percent in ICUs (95 percent CI 0.62-0.94)[8,9,13,14] corresponding to an increase by one RN FTE per patient day. In contrast, one study[19] reported that every patient per LPN/LVN reduced LOS by 22 percent (95 percent CI 0.71-0.86).

Patient outcomes in quartiles of nurse to patient distribution. We analyzed the relative risk of patient outcomes among different quartiles of patients per RN per shift distribution (Figures 10-12). Relative risk of hospital acquired pneumonia was 0.75 times less in surgical patients when an RN was assigned to 4.9 patients compared to more than five patients per shift (Figure 10). In medical patients, the reduction in ratio from more than six to two or less patients per RN per shift was associated with a 41 percent reduction in hospital acquired pneumonia. Relative risk of nosocomial infection was 94 percent less in surgical patients corresponding to a reduction from 2.8 to two or less patients per RN per shift. A significant consistent across the studies reduction in relative risk of nosocomial infection in medical patients was observed by 33-38 percent when one RN was assigned to less than two patients. In contrast, the relative risk of urinary tract infection was higher in medical patients corresponding to an increase in RN staffing.

The effect of reduction in patients per RN per shift on patient outcomes was greater in ICUs and in surgical patients (Figure 11). The relative risk of cardiopulmonary resuscitation was 0.54 and 0.75 times less when one RN was assigned to 3.3 and more than four patients, respectively compared with two patients per RN per shift. Surgical patients experienced cardiac arrest 0.69-

0.75 times less often with less than two patients per RN vs. 2.8 and 4.9 patients per RN respectively. The reduction in RN workload was consistently associated with a decrease in relative risk of failure to rescue in surgical patients by 25-39 percent when one RN was assigned to less than two patients vs.4.9 and more than five patients, respectively. The same direction of association in ICUs and in surgical patients was shown with the reduction in relative risk of pulmonary failure, and unplanned extubation across quartiles of patients per RN per shift distribution (Figure 12). A nonlinear association between patients per RN ratio and medical complications was observed in ICUs. The reduction from 3-3.6 patients per RN to less than 1.5 patients was associated with a relative decrease by 17 percent ($p = 0.03$, heterogeneity NS) in LOS in ICUs. The LOS was 22 percent shorter with a ratio of 1.6-2.5 patients per RN compared with 3-3.6 patients per RN in ICUs ($p = 0.03$, heterogeneity NS).

In conclusion, despite the substantial heterogeneity in the studies, some consistent evidence from observational studies suggests that increased RN to patient ratio is associated with a reduction in hospital-related mortality, failure to rescue, unplanned extubation, pulmonary failure, and bloodstream infections after adjustment for patient and provider characteristics and reduced LOS of surgical patients. While the effect size is greater in surgical patients and ICUs, the optimal ratio seems to be within the first quartiles of distribution of patients per RN per shift in ICU and in surgical patients. The evidence in medical patients is less consistent and needs further investigation.

Question 2. Association Between Nurse Hours per Patient Day and Patient Outcomes

Total Nurse Hours per Patient Day and Hospital Related Mortality

Four studies examined the association between total nurse hours per patient day and hospital related mortality, three at the hospital level[26-28] and one at the unit level.[139] A consistent and significant reduction in death rate by 1.98 percent for every additional nurse hour per patient (95 percent CI 0.96-3 percent) was observed ($p = 0.0005$, heterogeneity NS). The rate was slightly higher (2.1 percent) in three studies analyzed at the hospital level (95 per cent CI 1-3.1 percent, $p = 0.0004$). Every additional nurse hour per patient day reduced the death rate by 1.4 percent (95 percent CI 0.5-2.3) in medical patients[26-28] and by 2.3 percent (95 percent CI 1.2-3.3) in surgical patients[26,27] (heterogeneity NS). One large study reported non-significant changes in the relative risk of death corresponding to an increase by one hour in total nursing hours per patient day.[27]

RN hours per patient day and hospital related mortality. The association with RN hours per patient day did not show significant changes in mortality rates in four studies.[26-28,139] Pooled analysis that examined the relative risk of death in relation to RN hours per patient day did not detect significant association.[18,19,26,27,30,141] Random changes in the risk of death were observed by pooling three studies at hospital level analysis[18,19,26,27,30] in medical units,[27] in surgical patients,[26,27] and in medical patients.[26-28] One multi-hospital study reported a 2 percent reduction in mortality (RR 0.98, 95 percent CI 0.97-0.99) in medical patients.[150] Another study demonstrated a small but significant increase in the relative risk of death corresponding to one additional RN hour per patient day.[141]

We conducted combined pooled analysis with RN hours per patient day reported by the authors and estimated from RN to patient ratios. An increase of one RN hour per patient day was associated with a small but consistent reduction in the relative risk of hospital-related mortality. A reduction of 1 percent was observed in ICUs (RR 0.96, 95 percent CI 0.99-1.0),[8,9,13,14,16] in surgical patients (RR 0.90, 95 percent CI 0.98-1.0),[12-16] and in medical patients (RR 0.99, 95 percent CI 0.99-1.0).[8,10,11,17-19]

LPN/LVN and UAP hours per patient day and hospital related mortality. Two studies examined the association between death rates and LPN/LVN hours per patient day[26,27] and three[18,19,27] reported the relative risk of death corresponding to increased LPN/LVN hours. After pooling all three studies, every additional LPN/LVN hour per patient day was associated with an increase in the crude death rate of 3.4 percent (95 percent CI 2.1-4.8). One study reported an additional LPN/LVN hour was associated with a 2.5 percent increase in the crude death rate in medical units (95 percent CI 1.8-3.2),[27] with a greater increase in surgical patients by 3.3 percent (95 percent CI 2.4-4.2)[26,27] (heterogeneity NS). Combined analysis of reported and estimated LPN/LVN hours detected inconsistent increases in death rate. The relative risk of hospital-related mortality was not significant in individual studies (Appendix G, Table G10) and pooled analysis. One study examined the association between mortality and UAP hours per patient day reporting random changes in crude death rates and adjusted risk of mortality.[27]

Patient outcomes corresponding to an increase of 1 total nurse hour per patient day. (Appendix G, Tables G11-G13). The results of pooled analysis of changes in patient outcomes corresponding to one additional nurse hour per patient day are presented in Table 14. The pooled analysis showed a significant consistent reduction in sepsis among surgical patients by 1.33 ± 0.27 percent,[26,27,46] failure to rescue by 3.53 ± 0.48 percent,[26,27] urinary tract infection by 4.23 ± 0.97 percent,[26,27,76,78] hospital acquired pneumonia by 2.2 ± 0.52 percent,[26,27,151] surgical wound infection by 0.31 ± 0.05 percent,[26,27] pressure ulcers by 2.26 ± 0.34 percent,[26,27,76,78,151] shock by 0.77 ± 0.14 percent,[26,27] pulmonary failure by 2.39 ± 0.49 percent,[26,27] and deep venous thrombosis by 0.45 ± 0.11 percent.[26,27] In medical patients an additional nurse hour per patient day was associated with a consistent reduction in failure to rescue by 1.39 ± 0.5 percent,[26,27] urinary tract infection by 1.88 ± 0.36 percent,[26-28,76-78,81] hospital acquired pneumonia by 0.89 ± 0.27 percent,[26-28,45,79,81] shock by 0.34 ± 0.05 percent,[26,27] and deep venous thrombosis by 0.15 ± 0.05 percent.[26,27]

An observed increase in nosocomial infection was not consistent across the studies. Differences in patient falls was significant in ICUs only[49,61,64,75,139] with a reduction by 0.08 ± 0.01 percent corresponding to additional nurse hour per patient day.

Pooled analysis of the adjusted relative risk (Figure 13) detected a significant 12 percent reduction in nosocomial infection corresponding to an increase of one nurse hour per patient day (95 percent CI 0.84-0.92), but the heterogeneity was significant (p for heterogeneity = 0.001).[33,45,46,63,80] However, a consistent nonlinear quadratic association was detected (p = 0.02) whereby an increase of more than nine total nurse hours per patient day was associated with a 13 percent reduction in the relative risk of nosocomial infection. One study reported a reduction in the risk of shock by 16 percent (95 percent CI 0.71-0.99) and in gastrointestinal bleeding by 1 percent (95 percent CI 0.98-0.99) per one total nurse hour per patient day. Two studies that assessed the relative risk of thrombo-embolic complications reported random changes in risk.[27,129] Three studies that examined the risk of sepsis found only random changes in relation to nurse hours.[27,46,62] Four studies that assessed the risk of pressure ulcers and total nurse hours did

not detect significant changes.[27,62,129,151] Two studies that assessed relative risk of pulmonary failure also showed random change in risk of the outcomes.[27,62] The relative risk of hospital acquired pneumonia was not associated with total nurse hours.[27,62,81,129,151] Nursing hours were not associated with failure to rescue in one study.[27]

Patient characteristics can influence the association between outcomes and nurse hours. (We rely here largely on broad definitions like surgical vs. medical patients.) The adjustment for comorbidities[28,29,36,65,75,76,139,153,154] attenuated the effect of nursing hours on patient falls (p for interaction <.0001) and the risk of nosocomial infections and nurse hours per patient day (p for interaction = 0.001).[45,46,81]

Patient outcomes corresponding to an increase by 1 RN hour per patient day. The results of a pooled analysis of the rates of various patient outcomes (Appendix G, Tables G14-G15) corresponding to one additional RN hour per patient day (reported by the authors and estimated from RN FTE per patient day ratios) are presented in Table 15. The associations varied in different clinical settings. In ICUs, an additional RN hour per patient day was associated with a consistent reduction in patient falls by 0.06 ± 0.01 percent[61,64,75,139]and pulmonary failure by 1.43 ± 0.23 percent.[13,14,23] In medical patients, a consistent reduction in bloodstream infection by 0.22 ± 0.09 percent was seen[22,26-28,45,47,79] with a significant but not consistent decrease in pressure ulcers by 1.06 ± 0.32 percent.[26-28,33,36,61,63,64,76,77,154-156]

Additional RN hours were associated with an increase in rates of urinary tract infection in surgical and medical patients and hospital acquired pneumonia in medical patients (heterogeneity significant for all these associations).

Pooled analysis of the adjusted relative risk is presented in Figure 14 with a significant but not consistent reduction in nosocomial infection by 24 percent (95 percent CI 0.69-0.83) corresponding to one additional RN hour per patient day (p for heterogeneity <0.01).[45,147] One study reported a significant 21 percent reduction in the relative risk of central line associated bloodstream infections by (p <.0001) corresponding to an increase of one RN hour per patient day in surgical patients in ICUs.[147] The large multi-center study showed a significant reduction by 1 percent in urinary tract infection in medical patients (RR 0.99, 95 percent CI 0.98-1) corresponding to one additional RN hour per patient day and absolute reduction by 3.6 percent in rates of urinary tract infection comparing 25th and 75th percentiles of RN hours. The same study also reported a relative reduction by 2 percent (RR 0.98, 95 percent CI 0.97-0.99) in upper gastrointestinal bleeding in medical patients per additional RN hour per patient day and a 5.2 percent absolute reduction in the rate of this outcome between the 25th and 75th quartiles of RN hours. We conducted a combined pooled analysis using measures reported by the authors and estimated from ratios of RN hours per patient day (Figure 15). Additional RN hours per patient day in ICUs were associated with a reduction in relative risk of hospital acquired pneumonia,[13,14,22] pulmonary failure,[13,14,23,24] unplanned extubation,[13,14,23-25] and nosocomial infection.[22,45, 47,79,147] In surgical patients, the relative risk of failure to rescue was lower by 1 percent,[12,15,16,20,26,27, 30,31] unplanned extubation by nine percent,[13,23,24] and cardiac arrest by four percent[13,23,24] for every additional RN hour per patient day. Small reductions by 1 percent in relative risk of pulmonary failure[35,62] and deep venous thrombosis[27,35] was detected in medical patients.

Patient outcomes corresponding to an increase by one LPN/LVN hour per patient day. Patient outcome rates from pooled analysis corresponding to one additional LPN/LVN hour per patient day are presented in Table 16. The crude rates of most outcomes increased corresponding

to an additional one LPN/LVN hour per patient day; this raise was consistent across the studies (heterogeneity NS for all outcomes). However, additional LPN/LVN hours were associated with lower rates of several outcome in medical patients. Patient falls were lower by 0.21 ± 0.03 and sepsis was lower by 0.29 ± 0.12 percent per 1 LPN hour per patient day (heterogeneity NS).

Pooled analysis of the studies that analyzed relative risk of hospital acquired pneumonia[26,27,33,157] and studies that assessed the risk of urinary tract infections[26,27,33,77,157] did not find significant associations with LPN/LVN hours.

One study[158] reported a reduction in the rate of thrombo-embolic complications by -0.3 ± 0.1 percent (p = 0.01), of pulmonary failure by -1.2 ± 0.2 percent (p = 0.002), and pneumonia by -1.7 ± 0.3 percent (p = 0.002) corresponding to one additional LPN/LVN hour per patient day (Appendix G, Table G16). One study detected a significant reduction by 87 percent in the relative risk of hospital acquired pneumonia (p = 0.004) for one LPN/LVN hour per patient day.[18]

Patient outcomes corresponding to an increase of one licensed hour per patient day. The rate of pressure ulcers,[64] failure to rescue,[27,159] falls,[64,65] and CPR[159] was not associated with licensed hours per patient day. One large study reported a reduction by 11 percent in risk of urinary tract infections (RR 0.89, 95 percent CI 0.8-0.99), by 1 percent in gastrointestinal bleeding (RR 0.987, 95 percent CI 0.98-1.00) and hospital-acquired pneumonia (RR 0.99 95 percent CI 0.98-1.00), and by 3-4 percent in pressure ulcers (RR 0.97, 95 percent CI 0.94-0.99) and bloodstream infections (RR 0.96 95 percent CI 0.95-0.97) corresponding to an additional licensed hour per patient day in surgical patient at hospital level analysis.[27] The relative risk of shock,[27,159] thrombosis,[27] combined complications,[27] and hospital-acquired pneumonia was not associated with licensed hours per patient day[27,159]

Patient outcomes corresponding to an increase by 1 UAP hour per patient day. The results of the pooled analysis of patient outcomes corresponding to 1 additional UAP hour per patient day are presented in Figure 16. An increase of 1 UAP hour per patient day was associated with a significant consistent reduction in pressure ulcers by 2.07 percent (0.88-3.26) (heterogeneity NS),[27,36,76-78] patient falls by 0.2 percent (95 percent CI 0.14-0.26),[33,36,61,75,76,78] and urinary tract infection by 1.26 percent (95 percent CI 0.16-2.36).[27,33,76-78] We could find no studies that examined the relative risk of patient outcomes corresponding to UAP hours (Appendix G, Table G17).

Length of stay corresponding to an increase by 1 nurse hour per patient day. The results from a pooled analysis of changes in the length of stay corresponding to 1 additional total nurse hour per patient day are presented in Figure 17. An additional total nurse hour per patient day was associated with a decreased LOS by 1.43 days (95 percent CI 0.31-2.25) in eight studies (heterogeneity NS),[26-28,36,45,48, 82,83] by 0.45 days in medical patients (95 percent CI 0.19 -0.72, heterogeneity NS),[26-28,36,45,48,82,83] and by 2.36 days in surgical patients (95 percent CI 1.34-3.39, heterogeneity NS).[26,27,48,82,83] The association between RN hours per patient day and LOS was not consistent across the studies with random changes in the pooled estimate and significant heterogeneity in the results (p for heterogeneity = 0.05).[26-28,36,45] The relationship between nurse staffing and LOS in medical patients showed conflicting results (p for heterogeneity = 0.0008).[26-28,36,45] The studies in surgical patients did not find a significant association with RN hours (p for heterogeneity = 0.013).[26,27]

The studies that examined the association between LPN/LVN hours and LOS reported a significant increase by 3.21 days (95 percent CI 1.88-4.3) corresponding to an additional

LPN/LVN hour.[26,27] The effect was larger in surgical patients with an increase by 4.6 days for every LPN/LVN hour per patient day.[26,27] An increase by 1.53 days (95 percent CI 0.93-2.13) in LOS corresponded to 1 additional UAP hour per patient day (heterogeneity NS).[27,36,45] The increase in medical patients was 1.6 days (heterogeneity NS)[27,36,45]

Patient outcomes in quartiles of the distribution of nurse hours per patient day. We analyzed rates of patient outcomes among different quartiles of nurse hours per patient day distribution (Table 17). A decrease in nurse hours per patient day from 12.1 hours to 8.3 hours in ICUs was associated with an increase in the rate of patient falls by 0.76 ± 0.22 percent. A decrease in nurse hours per patient day from more than 11 vs. 9.5 hours in surgical patients was associated with an increase in the rate of failure to rescue by 3.22 ± 0.6 percent, surgical wound infection by 0.29 ± 0.05 percent, upper gastrointestinal bleeding by 0.81 ± 0.19 percent, shock by 0.68 ± 0.16 percent, pulmonary failure by 2.17 ± 0.5 percent, deep venous thrombosis by 0.42 ± 0.1 percent, urinary tract infection by 4.1 ± 0.85 percent, sepsis by 1.3 ± 0.24 percent, and pressure ulcers by 2.31 ± 0.31 percent. A reduction in the total nurse hours from more than 9.6 hours per patient day in medical patients was associated with a 0.36 ± 0.04 percent increase in the rate of shock, 2.49 ± 0.19 percent in urinary tract infection, and 1.35 ± 0.15 percent in hospital acquired pneumonia. The relative risk of failure to rescue was 8 percent higher in medical (RR 1.08, 95 percent CI 1.07-1.1) and 49 percent higher in surgical patients (RR 1.49, 95 percent CI 1.32- 1.69). When we compared the highest and the lowest quartiles of RN hours per patient day (Figure 18), the relative risk of cardiopulmonary resuscitation was 1.52 times higher corresponding to a decrease from more than 16 to 8.2 RN hours per patient day in ICUs. In surgical patients, a reduction from more than 10 to 8.4 RN hours per patient day was associated with a 66 percent increase in the relative risk of cardiac arrest (RR 1.66, 95 percent CI 1.49-1.85). The relative risk of unplanned extubation was three times higher in ICUs (RR 3.12, 95 percent CI 1.97-4.96) corresponding to a decrease in RN hours per patient day from more than 16 to less than six.

In conclusion, the evidence from observational studies suggests that an increase in total nurse hours per patient day was associated with reduced hospital mortality, failure to rescue, nosocomial bloodstream and urinary tract infections, and other adverse events. The effects of RN hours substantially differ among the studies and patient population. A few studies suggest that LPN/LVN hours may increase the rates of sepsis, shock, urinary tract infections, and hospital inquired pneumonia in surgical patients. Additional UAP hours reduced the rate of pressure ulcers, patient falls, and urinary tract infection but not other outcomes. Increasing to more than 16 RN hours per patient day may reduce the risk of cardiopulmonary resuscitation, pulmonary failure, and unplanned extubation in ICUs. Increasing to more than 10 RN hours per patient day in surgical patients is associated with reduced risk of CPR, failure to rescue, and unplanned extubation. The LOS in hospitals is lower along with additional total nursing, but not LPN/LVN and UAP hours.

Evidence of the association between nurse characteristics and patient outcomes. Some evidence (Appendix G, Table G18) suggests that nurse experience and education can influence patient outcomes (Figure 19). The crude rates of complications were reduced by 1.13 percent (95 percent CI 1.9-0.36) for each additional year of nurse experience in surgical patients in the ICU.[16] In the same study, an increase by 1 percent in the proportion of nurses with BSN degrees reduced the rate of failure to rescue by 0.04 percent (95 percent CI 0.06-0.02). The same study reported that an increase in the crude rate of failure to rescue corresponding to 1 year of nurse

experience was not significant after adjustment for confounding factors (RR1.01, 95 percent CI 0.96-1.03). The authors reported a 5 percent reduction in failure to rescue corresponding to a 10 percent increase in the proportion of nurses with BSN degrees (RR 0.95, 95 percent CI 0.91-0.99).[16] The adjusted relative risk of unplanned extubation in neonatal ICUs was not associated with nurse experience (relative risk 1.02, 95 percent CI 0.96-1.08 for an additional year of experience).[25] Other studies did not show significant changes in pressure ulcers, patient falls, or urinary tract infections in relation to nurse experience and education.

Several nurse surveys assessed perceived nurses' satisfaction about patient outcomes[21,36,66,78,88,101,160-164] (Appendix G, Table G19.) One large survey (8,760 nurses)[163] examined the relative risk of adverse events among Medicare patients in relation to perceived quality of care. Nurses responded to the survey question, "In general, how would you describe the quality of nursing care delivered to patients in your unit on your last shift?" A reduction by 16 percent in the relative risk of patient falls and medication errors corresponded to a 30 percent increase in nurses satisfied with the care provided.[163] An increase in the proportion of nurses' perceived work related stress by 40 percent increased the rates of patient falls by 1.1 percent.[66] A 2 percent increase in nurse autonomy accompanied a 0.5 percent reduction in pressure ulcer rates.[162] An increase in nurse turnover by approximately 2 percent increased the rate of patient falls by 0.2 percent.[36]

There is limited evidence suggesting better nurse staffing is associated with patient satisfaction with nursing care and pain management (Appendix G, Table G-20). In an early study of this phenomenon, larger proportions of patients treated in magnet-designated hospitals were satisfied with provided care compared with conventional (nonmagnet designated) general medical units (85percent vs. 74 percent).[160] Surgical patients in units using a total patient care model (larger proportion of RNs) were more satisfied with pain management compared with a team nursing model (84.6 ± 13 vs. 83.4 ± 13 scores on the Parkside Patient Satisfaction Survey).[165] Medical patients in units with higher proportions of RNs with BSN degrees (54percent) expressed satisfaction with care 1.5 times more often.[88] An increase by 1 hour in total nurse hours per patient day was associated with an increase by 2.44 ± 0.62 patient satisfaction scores with pain management, an increase by 1 percent in the proportion of nurses with BSN degrees was associated with greater satisfaction by 13.6 ± 3.6 patient satisfaction scores.[154] Some studies, however, did not detect a significant improvement in patient satisfaction in relation to nurse staffing.[77,78,166]

In conclusion, some evidence from a few observational studies suggests that an increase in nurses with BSN degrees may reduce the risk of hospital-related mortality and failure to rescue. Hospitals with higher proportions of nurses with BSN degrees (36 percent vs.11 percent) have lower mortality. States with larger proportions of BSN degrees report lower rates of fatal injuries related to health care. Nurses' perceived satisfaction may reflect the quality of care.

Question 3. What Factors Influence Nurse Staffing Policies?

Policies related to nurse staffing in hospitals can vary. There may be policies related to the shift length, scheduling nurses to rotate to different shifts, mandatory overtime, weekend staffing, use of agency or temporary nurses, assigning nurses to nursing units other than those they are regularly assigned to work (floating), use of full-time, part-time, and internationally

educated nurses, the nurse-to-patient ratio or nursing hours per patient day for nursing units, and the skill mix (licensed vs. unlicensed staff) of nursing units (Figure 2). Staffing policies can be influenced by patient and patient care unit factors. For example, the fluctuation of patient flow on a nursing unit may determine policies for the length of the shift for nurses. Nurse staffing policies can also be influenced in hospitals in which nurses are unionized or in which nurses have a strong governance structure. The age and/or tenure of nurses in a hospital may have an impact on policies regarding rotating shifts or frequency of working weekends.

Review of the literature to determine factors that can influence nurse staffing policies did not reveal any studies that empirically examined influences on nurse staffing policy. Rather, all studies found for this review examined one or more of the staffing policy variables. Thirty-six studies were identified as eligible and relating to one or more of the staffing policy variables. One hundred forty-seven studies were identified as eligible and relating to one or more of the staffing policy variables (Appendix G, Tables G21-G26). One hundred seventeen studies were excluded for the following reasons: not related to the variable of interest (87); from conference proceedings (2); an integrative review not related to the variables of interest (1); relevant to nursing homes (3); not in peer reviewed journals (17); inadequate presentation of data (6); not research (1). A review of 30 studies for each of the staffing policy variables is provided. For the staffing policy variable *staffing ratio/mix/hours*, the findings from the studies analyzed for questions 1, 2, and 4 are applied. The factors identified in Figure 2 were included in a few of the studies reviewed and will be described in the review for each of the staffing policy variables. Some studies addressed more than one staffing policy variable and are included in more than one evidence table.

Staffing Ratios/Mix/Hours

The research literature related to nurse staffing ratios or hours and staff mix was comprehensively reviewed in the first two questions examined for this review using meta-analytic approaches. None of the studies empirically examined the effect or impact of a staffing policy related to staffing ratios/hours or staff mix. However, several studies examined the impact of the California mandated staffing ratios—an externally imposed staffing policy[64,109,162] (Appendix G, Table G21). These findings should be cautiously used to inform staffing policies because these studies have limitations in their design and data sources.

Licensed nurses working in California acute care hospitals and nurse staffing in those hospitals were characterized prior to the implementation of mandated nurse staffing ratios.[109] A low percentage of RNs (39 percent) have baccalaureate degrees and the mix of RNs ranged from 30 percent (sub-acute/transitional) to 84 percent (postpartum/labor/delivery) by different types of nursing care units. RN-to-patient ratios varied by type of hospital ownership in California (1:3.2 to 1:7.4)[162] as well as RN skill mix (56.9 percent to 66.6 percent). Following the implementation of the mandated staffing ratios, total RN hours of care per patient day increased by 20.8 percent and the number of patients per RN decreased by 17.5 percent. There was no change in the use of contract staff. However, despite the increased exposure of patients to RN time, there was no reduction in falls, the prevalence of pressure ulcers, or restraint use.[64]

Two recent systematic reviews of nurse staffing and patient, nurse, and hospital outcomes reached basically similar conclusions.[92,93] Both concluded that the studies reviewed had a number of limitations which implies caution in interpretation of the findings and translating

findings to staffing policies (e.g., data from one unit or hospital, no control for case mix variations, variations in staffing and outcome measures, hospital level data, or data presented as regression coefficients which are difficult to interpret clinically). Other variables likely associated with quality of care should be considered for hospital staffing policies or legislated staffing ratios.[92] These included acuity of the patients, skill mix, competence of nurses, technological support, and institutional support of nursing. This research supports probable relationships between richer nurse staffing and several patient and nurse outcomes; whereas another study showed strong support for the positive relationship between higher RN skill mix and improved outcomes.[93]

Studies with implications for staffing policies that were related to nurse-patient ratios or RN skill mix, but found to be ineligible for meta-analysis, are summarized in Appendix G, Table G21. A study conducted in 19 teaching hospitals in Ontario, Canada, supported the relationship between RN skill mix for patient, nurse, and hospital outcomes. The proportion of Regulated Nursing Staff (Canadian equivalent of RNs in the United States) was associated with better patient outcomes in regard to function, pain, satisfaction[167] infections, nurses' perceptions of the quality of care, and fewer medication errors.[168,169]

Several studies found marginal, and in some cases diminishing effects, of increased RN staffing and patient outcomes. Greater than 15 nursing hours per patient day on medical and medical-surgical units no longer improved the patient fall rate; however, on surgical units, fall rates improved when nursing hours exceeded 15 hours.[170] Diminishing effects of increased RN staffing on reducing the mortality ratio were also found.[18]

The findings from the meta-analyses in this report related to nurse-patient ratios/hours and RN skill mix and specifically examined the relationship between nurse staffing and patient and nurse outcomes. These studies did not examine relationships between hospital factors, patient factors, or nursing characteristics on nurse staffing policy variables. However, the findings from the meta-analyses conducted with these studies may have implications for nurse staffing policies regarding RN skill mix or nurse-to-patient ratios. The largest proportion of studies for the meta-analysis was associated with nurse to patient ratios and hospital related mortality. The findings indicate that a higher RN to patient ratio is associated with a decrease in hospital-related mortality. Nurses with baccalaureate degrees in nursing were associated with a reduction in mortality. Negative patient outcomes are also reduced by increasing the RN to patient ratio. There is less evidence for how LPNs/LVNs and UAPs reduce negative patient outcomes; in fact, there is a trend indicating that an increased LPN/LVN and UAP to patient ratio increases negative outcomes. The studies examining the relationship between RN hours per patient day differed substantially; however, there was stronger evidence that total nurse hours per patient day were associated with reduced mortality and negative patient outcomes. Again, there was a trend indicating that LPN/LVN and UAP hours per patient day were associated with increased negative patient outcomes. The findings from the meta-analysis examining nurse staffing ratios suggest hospital staffing policies that provide for a higher RN skill mix. If staffing ratios become part of a hospital staffing policy, they need to consider the type of patient as well as other factors that may impact desired patient and nurse outcomes (e.g., education of nurse, care delivery models, patient factors). Staffing policies that require regular evaluation of staffing effectiveness on patient care units serving different types of patients would seem essential.

Figure 2 suggests that nursing organizational factors have an intervening effect on the relationship between hospital factors and nurse staffing policies. None of the studies reviewed

for question 3 supported this relationship, although several studies examined the direct relationship between hospital factors and nurse staffing policy variables. The technological sophistication of hospitals (technology level) was associated with a higher proportion of RNs on the unit.[171] More sophisticated use of technology predicted increased RN hours.[162] For-profit hospitals and for-profit systems had fewer RN productive hours for medical-surgical nursing units; however, this finding seemed to be driven by two large for-profit health systems in the sample.[162] Another study did not find that ownership was related to nurse staffing variables.[172] The two studies were conducted in two different states. They did find that the type of unit (patient care unit factors) affected hospital RN staffing. Intensive care, pediatric, and maternity units had significantly higher RN staffing than medical/surgical or gynecologic units. Controlling for size, rural hospitals also had higher RN staffing. Primary nursing, a nursing care delivery model, explained more than half of the variability in nurse staffing, using about one-third more RNs per occupied bed.[172] While nursing care delivery models were not hypothesized in Figure 2 to be a factor influencing nurse staffing policies, it makes sense that it would be a factor because the primary nursing care delivery model relies on a higher proportion of RNs to be successfully implemented.

Shift work of nurses. Seven studies specifically focused on the length of shift nurses work (8, 10, and 12 hours) and the types of shifts nurses were scheduled to work (days, evenings, nights, or a combination) (Appendix G, Table G22). Two recent survey design studies examined the work patterns of hospital staff nurses. A survey of nurses who were members of the ANA (n=393)[173] and a randomly selected sample of nurses who participated in the National Institute for Occupational Safety and Health (NIOSH) Nurse Worklife Survey (n = 2,273)[174] both found that nurses were working long hours. Nurses worked, on average, 55 minutes longer than scheduled each day.[173] Of the 5,317 shifts worked by the respondents during a 28 day period, 38.7 percent of the shifts were 12.5 hours or more. One quarter of the respondents worked 50 hours per week for two or more weeks of the 28-day period. More than half of hospital nurses were working 12 or more hours per day but half as likely to work 6-7 days a week, suggesting that more hospital nurses are working 12 hour shifts. Older nurses (≥50 years) were less likely to work long shifts.[174]

The likelihood of making medication and procedural errors (actual and near miss errors) increased with longer work hours and was three times higher when nurses worked shifts lasting 12.5 hours or longer.[173] Age of the nurse (nurse factor), hospital size (hospital factor), or type of unit (unit factor) did not have any affect on errors or near errors. Among 687 RNs and LPNs surveyed in one hospital medication and procedural errors were associated with nurses that rotated shifts.[175] In addition, nurses who rotated shifts had a higher risk of having an automobile accident or other injuries. Among nurses from across the country who worked in critical care units on the day (n = 67) and night shifts (n = 75) the ones who worked permanently on the night shift had significantly more depression and poorer global sleep quality than nurses on the day shift.[176] There was no significant difference between night and day shift nurses in regards to chronic fatigue or anxiety. However, 46 percent of the variance in chronic fatigue was explained by depression and global sleep quality. There was no relationship between physical health and mental depression of nurses working the day, evening, night, and rotating shifts from five hospitals (n = 463).[177] Nurses working 12-hour shifts experienced significantly higher levels of stress than nurses working 8-hour shifts, but the stress levels were similar when controlling for experience.[178] Nurses working rotating shifts experienced higher stress and lower perception of

job performance. Nurses working the night shift reported receiving the least amount of sleep and had the most trouble sleeping.[177]

The findings from these seven descriptive studies that used survey methodologies indicate that nurses are working long hours. Because more nurses are working 12-hour shifts (by preference), the risk of working more than 12 hours is high, given that nurses are often not able to finish their work by the end of their scheduled shift. There is beginning evidence that working more than 12 hours and rotating shifts can lead to errors that compromise patient safety as well as accidents, injuries, and higher stress levels of nurses. Implications for staffing policies indicate that the length of nurses' shifts should be no more than 12 hours and strategies should be implemented to limit work hours exceeding 12 hours. Requiring nurses to work rotating shifts should be curtailed.

Contract (agency) nurses. There is little research on the use of agency staff (Appendix G, Table G23). One descriptive study indicates that nurses choosing to work for a staffing agency are not necessarily motivated by nonsalary benefits and hospital nurses are not motivated by the higher salary paid to agency nurses.[179] In that same survey, agency nurses were more likely to work evening and night shifts and weekends. The clinical activities differed by agency and hospital nurses reported having less opportunity to use their clinical skill.[180] Nurse managers do not view agency nurses as cost effective but believe that using agency nurses reduces overtime and provides coverage for weekends, vacations, and absenteeism. Managers' perceptions of quality care of supplemental staff did not differ for hospital pool supplemental staff versus agency staff.[181] Float pool nurses had the highest rate of documentation on two clinical aspects of patient care;[182] however, there were significant limitations to the study, including being conducted on only one unit of a hospital and using medical record documentation as a measure of evaluating nursing care quality of agency staff. From a hospital efficiency perspective, agency nurses were associated with higher hospital operating cost.[50]

These studies provide limited insight to guide implications for staffing policies regarding agency nurses. It should be noted that a number of studies were found on the use of agency nurses, but these studies were conducted in countries other than the United States and Canada. Research is needed to evaluate the effectiveness and effective use of agency staff in hospitals as a means to provide adequate staffing for quality patient care.

Full- and part-time nurses. Few studies addressed the full or part time status of nurses (Appendix G, Table G24). There were discrepancies in the demographics reported for full- and part-time nurses. Two large surveys of Canadian nurses demonstrated these differences. In one, part-time nurses were reported to be older,[183] whereas full-time nurses were older.[184] This difference may be related to a 10-year difference in the time these studies were done. A trend in the studies was that full-time nurses experienced higher role overload,[185] heavier workloads, higher levels of stress, and poorer physical wellbeing.[184] Full-time nurses were statistically more involved in their job[183] and more likely to be confident, independent, functioning as a leader and professional.[186] Nurses who worked part time reported liking their work schedules more and experienced less interference between their work and nonwork activities. From an organizational perspective,[187] Part-time nurses were associated with lower personnel and hospital costs.[50]

Internationally educated nurses. A strategy to address the nursing shortage and the growing demands of staffing in hospitals has been the utilization of IENs (Appendix G, Table G25). There is a paucity of research on the use and effectiveness of IENs in U.S. hospitals.[37] The limited research available includes qualitative exploratory studies[38,39] and descriptive studies[40-42]

that examined IEN use in healthcare. No studies empirically evaluated the interaction of IEN staffing policies with organizational, nurse, or patient care unit factors. Lack of research becomes more notable when it is recognized that IENs represent approximately 3.7 percent of the RN population within the United States.[37] Understanding this demographic group may facilitate more effective integration and use of nurses who are educated in and emigrate from other countries.

IENs experience moderate to high levels of stress for up to 10 years after coming to the United States to practice nursing.[39] IENs from India experienced racism within the work setting with recommendations for interventions to assist with acculturation.[38] Other idiosyncrasies noted about IENs include the tendency to gravitate to critical care,[40,42] younger in age,[37,42] the majority from the Philippines,[37] more likely to work full-time, night, and evening shifts and more overtime,[37] baccalaureate educated,[37,42] and half as likely to leave the organization.[37] No differences were found between IENs and U.S. nurses when comparing perceptions of their control over practice or relationship with the physician,[41] job satisfaction as it relates to time to do the job or quality of care,[42] or general job satisfaction.[37,42] Despite the lack of empirical evidence that articulates the relationship of IENs within the organization, the accumulation of these exploratory and descriptive data may assist in understanding human resource demographics more clearly. Further studies are warranted to understand healthful integration of IENs into the acute care system of the United States for the purpose of formulating organization policy.

Nurse overtime. Another staff policy to secure adequate staffing for increasing patient demands and scarce resources is the use of overtime (Appendix G, Table G26). Again, few studies were found in regards to this staffing variable. The prevalence of overtime has been documented in a recent national survey. Seventeen percent of randomly selected nurses reported required mandatory overtime and those whose jobs included mandatory overtime worked significantly longer work hours.[174] Almost two-thirds of nurses, in a survey of RNs who were members of the ANA, worked overtime ten or more times during a 28-day period and more than 25 percent reported working mandatory overtime.[173]

Unionization does not seem to be effective in minimizing overtime. A review of overtime use in New York State hospitals for 5 years found that overtime was 22 percent higher for unionized nurses.[43] Occupancy, average hourly wage, and hours in the average work week were not associated with RN overtime within hospitals. When controlling for year-to-year variations in overtime for each hospital, higher RN straight hours was significantly associated with higher RN overtime. Each 1 hour increase in straight time was associated with an 8.7 percent increase in overtime.[43,44]

RN overtime does not seem to be associated with the location of the hospital, teaching status of the hospital, average hours in a nurse's work week, acute bed occupancy, acute average daily census, or financial margin of the hospital44 however, an analysis of nurse overtime over 7 years in New York State hospitals found that overtime increased more in nongovernment unionized hospitals and nonteaching hospitals.[43] Working overtime increased the odds of making at least one medication-related error and the risk of making errors increases when nurses work overtime after longer shifts.[173] Weekend overtime is associated with anticipated turnover.[188] Lost time claim rates were associated with increasing overtime worked by nurses.[189] A few studies suggest that mandatory overtime and overtime in general is prevalent for nurses in U.S. hospitals. There is evidence that overtime and excessively long working hours can compromise patient safety and impact turnover of nurses. These findings suggest that practices related to nurse overtime and associated policies are important.

Question 4. Association Between Nurse Staffing Strategies and Patient Outcomes

We defined eligible nurse staffing strategies as skill mix (proportion of productive [i.e., direct patient care related] hours worked by registered and licensed nurses), the proportion of overtime hours, contract hours, and the proportion of full-time nurses employed in patient care. The distribution of nurse staffing strategies is presented in Table 18. We identified 48 studies that assessed the proportion of RNs; eight studies addressed licensed nurses; 12 studies examined the effects of contract nurse hours on patient outcomes; and only a few studies evaluated overtime hours and the proportion of full-time nurses. The details on the sources used to measure nurse staffing strategies and on study design are presented in Appendix G, Tables G27-G28.

Patient Outcomes Corresponding to an Increase by 1 Percent in the Proportion of RNs

Studies examined the effects of changes in categories of nurse staffing patterns including not only the proportion of RNs, but nurse hours and ratios on a number of outcomes. Pooling these results with random effects models to examine the main effect of the nursing skill mix on patient outcomes detected substantial heterogeneity between studies. For instance, heterogeneity was significant when pooling eight studies that examined the rates of in-hospital mortality (p for heterogeneity = 0.04),[26,28,33,52,139,140,146.190,191] eight studies that measured the rates of nosocomial infections (p <0.001),[22,45,81,139,192-194] and 11 studies that evaluated the rates of pressure ulcers in relation to nursing skill mix (p for heterogeneity <0.001).[26,28,33,36,61,64,76,77,81,151,162]

To estimate whether the direction or strength of the associations can explain the massive differences in the results, we calculated and compared the rates of outcomes in individual studies (Appendix G, Table G28) when possible (Table 19). Three studies reported significant reductions in mortality[140,190,191] by 0.1-0.4 percent; one unpublished dissertation showed a small but significant increase in mortality[86] by 0.04 percent; the rest did not find significant associations. The same unpublished study reported a small increase in pulmonary failure and other patient outcomes corresponding to an increase in RNs.[33] Random changes in the rates of nosocomial infections were shown in the majority of the studies. One study detected a reduction in hospital-acquired pneumonia by 0.02 percent (95 percent CI 0.01-0.02).[28] A seemingly paradoxical finding was the increase in the rates of urinary tract infections in four studies, with a significant increase by 0.05-0.11 percent for each increase in the percent of RNs in two reports.[28,33] One study[139] reported nonlinear association in patient falls and pressure ulcers: the rates increased when more than 87.5 percent of RNs worked in units. Pooled analysis (Figure 20) detected a significant reduction in patient falls by 0.03 percent (95 percent CI 0.03-0.04) corresponding to one additional percent of RNs in ICUs. Rates of patient outcomes were increased in medical and surgical patients per additional percent of RNs.

The analysis of the adjusted relative risks of patient outcomes corresponding to an increase by 1 percent in RN composition is presented in Figure 21. Random changes in the relative risk of all patient outcomes were observed corresponding to each additional percent of RN time. One large study[27] contributed the most to the analysis. One study reported a 16 percent reduction in hospital-related mortality in hospitals with 83 percent of RNs compared with 63 percent (RR

0.84 percent CI 0.78-0.92).[195] Three studies reported a tendency to reduce mortality,[8,26,101] and one large study[27] found substantial differences in the association with mortality in different levels of analysis and patient populations, which resulted in significant statistical heterogeneity in the results (p for heterogeneity <0.001) (Figure 22). The same study,[27] however, reported a consistent reduction in failure to rescue by 27 percent (RR 0.73, 95 percent CI 0.65-0.83) for an additional percent of RN staffing. Pulmonary failure (Figure 23) was not associated with the proportion of RNs in one study.[27] Another study reported a nonsignificant reduction by 25 percent (RR 0.11-4.98) in relative risk of pulmonary failure corresponding to doubling the proportion of RNs.[62] The relative risk of shock was reduced by 41 percent for each additional percent of RN staffing in a large multi-hospital study.[27] The studies did not show significant associations with nosocomial infections, surgical wounds infections, and bloodstream infections. One study reported a significant reduction in the risk of urinary tract infections in surgical patients.[27] Overall complications and thrombo-embolic complications increased with the increase in the proportion of RNs.[27] An increase by 1 percent in the proportion of RN staffing was associated with a reduction in the risk of upper gastrointestinal bleeding by 42 percent (RR 0.58, 95 percent CI 0.4-0.84) and in pressure ulcers by 76 percent (RR 0.24, 95 percent CI 0.09-0.62) across different settings and patient populations in one study (Figure 24).[27] The same study reported a reduction in the relative risk of urinary tract infection in medical (RR 0.48, 95 percent CI 0.38-0.91) and in surgical patients (RR 0.67, 95 percent CI 0.46-0.98), upper gastrointestinal bleeding (RR 0.66, 95 percent CI 0.45-0.96), hospital acquired pneumonia (RR 0.59, 95 percent CI 0.44-0.8), and shock (RR 0.46, 95 percent CI 0.27-0.81) corresponding to an increase by 1 percent in the proportion of RN hours among licensed hours per patient day.[27]

A higher proportion of RNs was associated with shorter lengths of stay by 0.17 days (95 percent CI 0.03-0.3) but the association was not consistent across studies (p for heterogeneity <0.001). The effect was significant in medical patients only with a decrease by 0.19 days for each 1 percent of RN staffing (95 percent CI 0.1-0.28) but still not consistent (p for heterogeneity <0.05).[26,28,33,36,45,48,146,150,194]

Patient Outcomes Corresponding to an Increase by 1 Percent in the Proportion of Licensed Nurses

Eight studies attempted to assess the proportion of licensed nurses in relation to patient outcomes[26,27,30,31,35,63-65,159] (Table 20 and Figures 25-26) but one study[27] contributed most of the data for the overall estimates. An increase by 1 percent in the proportion of licensed nurses was associated with a 17 percent reduction in the risk of failure to rescue (RR 0.83, 95 percent CI 0.78-0.87) (Figure 25). Hospital-related mortality was reduced by 3 percent (RR 0.97, 95 percent CI .95-0.98) for every additional percent of licensed nurses. Cardiac arrest occurred 0.59 times less often in association with a 1 percent increase in the proportion of licensed nurses in medical and surgical patients (RR 0.59, 95 percent CI 0.49-0.71) (Figure 26). Pulmonary failure demonstrated random changes in relation to nurse skill mix. Every additional percent of licensed nurses was associated with a 47 percent reduction in the relative risk of shock (RR 0.53, 95 percent CI 0.46-0.61). The risk of hospital acquired pneumonia was reduced by 29 percent (RR 0.71, 95 percent CI 0.63-0.8) in relation to every additional percent of licensed nurses, but the strength of the association differed across patient populations (p for heterogeneity = 0.02).

Among other nosocomial infections, the risk of urinary tract infections was reduced by 13 percent (RR 0.87, 95 percent CI 0.83-0.9), while the risk of surgical wound infection and bloodstream infections was increased by 60 percent as reported in one study.[27] The same negative tendency was observed in the risk of thrombo-embolic complications, where a 29 percent increase corresponded to an additional percent of licensed staff (RR 1.29, 95 percent CI 1.08-1.54). One study reported a significant increase in the length of stay by 0.05 days (95 percent CI 0.04-0.05) for each additional 1 percent of licensed nurses.[35]

Patient Outcomes Corresponding to an Increase by 1 Percent in Overtime Hours

Two studies[30,193] examined the association between overtime hours and patient outcomes (Appendix G, Table G29). Every additional 10 percent of overtime hours was associated with a 1.3 percent increase in hospital related mortality (RR 1.013, 95 percent CI 1.0001-1.65).[30] The association was nonlinear ($p = 0.006$) with an increase in hospital-related mortality by 32 percent corresponding to an increase in overtime hours by 10 percent from nadir (7 percent) to 17 percent.

The rate of nosocomial infections increased by 1.9 percent (95 percent CI 0.3-3.5 percent) with each additional percent of overtime hours.[193] The relative risk of shock increased by 12 percent in medical but not surgical patients (RR 1.12, 95 percent CI 1.001-1.24) corresponding to a 5 percent increase in overtime hours.[31] The relative risk for bloodstream infections increased by 11.5 percent in surgical (RR 1.12, 95 percent CI 1.021-1.22) and by 14 percent in medical patients (RR 1.14, 95 percent CI 1.05-1.24).[31] That study did not find an association between overtime hours and urinary tract infections, failure to rescue, or gastrointestinal bleeding.

Patient Outcomes Corresponding to an Increase by 1 Percent in Contract Hours

The majority of the studies that reported the proportion of contract hours did not examine the main effect of temporary nurses; rather they reported patient outcomes in units and hospitals with different staffing patterns including nursing ratios and hours. Some authors distinguished contract hours from hours worked by float nurses;[28.46,64,193] others included the hours worked by float nurses as temporary hours.[45,47] One study showed no association between contract hours and the rates of urinary tract infections, pneumonia, pressure ulcers, surgical wound infections, or bloodstream infections.[28] Two studies reported an increase in rates of patient falls corresponding to additional contract hours.[28,64] A small increase in the rate of nosocomial infections corresponded to an increase in contract hours,[193] but another study did not find a significant association after adjustment for other factors.[46] In contrast with contract hours, the proportion of float nurses was positively associated with the risk of nosocomial infection. The risk was 2.61-2.71 times higher in patients cared for in units with more than 60 percent of float nurses.[47] Another study reported an increase in the rate of bloodstream infection by 5 percent corresponding to a 23 percent increase in the proportion of float nurses.[45] Summarizing the results from two studies[46,47] that examined the risk of sepsis in relation to float nurses, the risk was 2.79 time higher for every percent increase in float hours (RR 2.8, 95 percent CI 2.8-2.79).

An increase in the proportion of temporary nurses by 1 percent of contract hours increased the length of stay by 0.1 day (RR 0.11, 95 percent CI 0.03-0.18, heterogeneity NS).[28,45,48,50]

In conclusion, some evidence from a few multi-hospital studies suggests that a higher proportion of RNs may reduce the risk of failure to rescue, shock, pressure ulcers, and gastrointestinal bleeding. A significant but not consistent reduction on LOS in medical patients was observed pooling the results from 12 studies.

Overtime hours may increase the risk of hospital-related mortality and bloodstream infections. An increase in contract hours may increase in-hospital LOS. A small amount of evidence suggests that an increase in hours worked by float nurses is associated with a large increase in the risk of bloodstream infections.

Figure 4. Flow of study selection for questions 1, 2, and 4

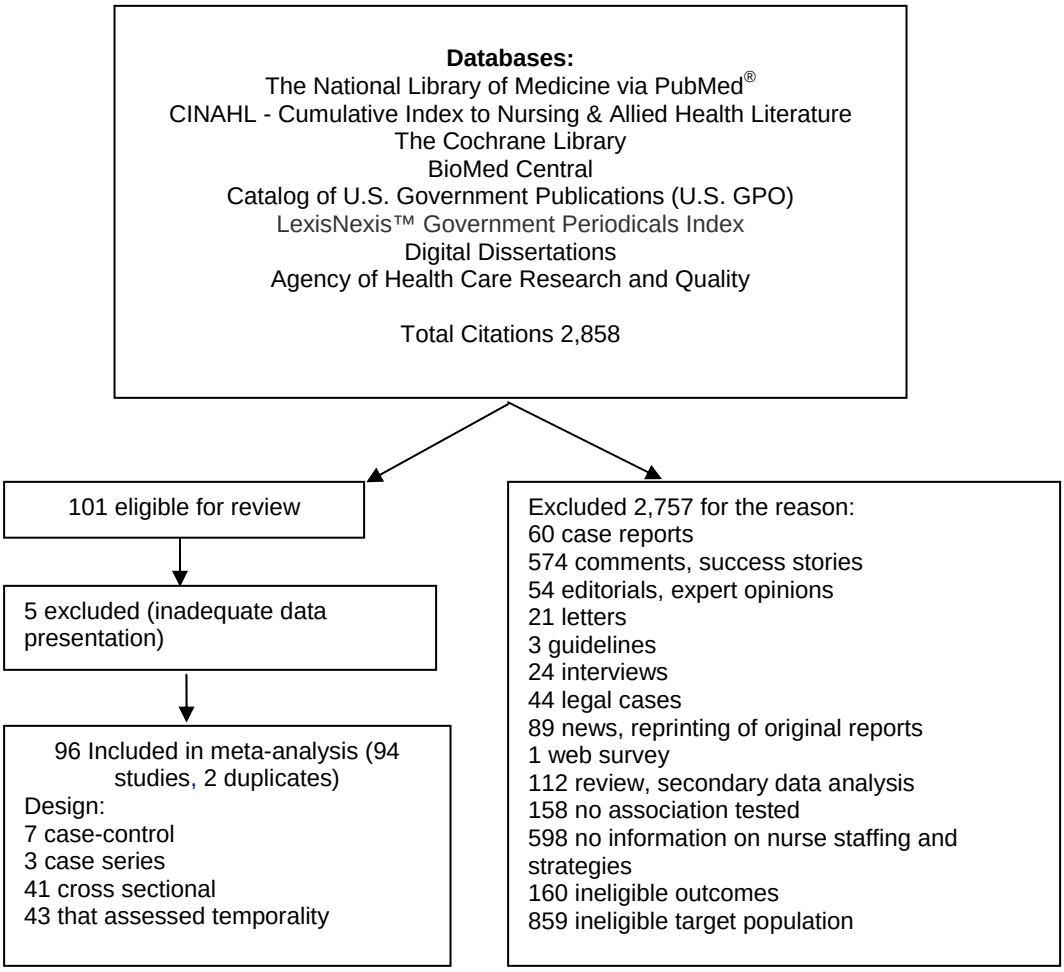


Table 2. Distribution of the studies' quality* (94 studies)

Quality Measures	Mean	Standard Deviation	Median
Study question clearly focused and appropriate	4.69	0.73	5
Clear definition of exposure	3.96	0.65	4
Clear definition of the primary and secondary outcomes	4.41	0.65	4.5
Sampling of study population	3.34	0.81	3
Statistical analysis: assessment of confounding attempted	3.61	1.11	4
Adjustment for the effects of various factors	2.89	1.62	3.5
Statistical methods	3.70	0.94	4
Measure of effect for outcomes	3.66	1.11	4
External validity	3.48	0.97	4
Conclusions	4.01	0.68	4
Total scores	37.76	6.40	38

* Maximum possible score of 5; total of 50 for each study

Table 3. Distribution of nurse hours and ratios (94 studies)

Nurse Staffing	Number of Studies	Mean	Standard Deviation
ICUs			
RN FTE/patient day	15	1.3	0.7
Patients/RN/shift	15	3.1	1.8
Total nursing hours/patient day	15	13.0	5.2
RN hours/patient day	10	12.6	5.3
LPN/LVN hours/patient day	3	0.3	0.6
UAP hours/patient day	4	2.3	1.2
Licensed nurse hours/patient day	1	7.3	0.4
Surgical patients			
RN FTE/patient day	13	1.1	0.8
Patients/RN/shift	13	4.0	2.3
Patients/LPN/shift	2	3.1	2.2
Total nursing hours/patient day	12	8.7	4.3
RN hours/patient day	11	8.1	5.1
LPN/LVN hours/patient day	7	1.3	1.1
UAP hours/patient day	5	2.1	0.6
Medical patients			
RN FTE/patient day	20	1.1	1.0
Patients/RN/shift	20	4.4	2.9
Patients/LPN/shift	6	13.3	8.5
Patients/UAP/shift	4	12.0	8.9
Patients/licensed nurse/shift	2	4.1	1.1
Total nursing hours/patient day	27	8.2	4.4
RN hours/patient day	23	6.1	3.6
LPN/LVN hours/patient day	13	2.3	2.0
UAP hours/patient day	12	2.5	2.1
Licensed nurse hours/patient day	4	3.3	2.9

Table 4. Hospital-related mortality rates corresponding to changes in patients/RN ratio (pooled weighted estimates from published studies)

Level of Analysis	Number of Studies	Change in Death Rate, %	Standard Error	p Value for the Association	p Value for Heterogeneity
Authors' definition of nurse to patient ratio					
Increase by 1 patient/RN/shift	3	0.095	0.03	0.003	0.33
Increase by 1 RN FTE/patient day	3	-1.24	1.13	0.311	0.041
Increase by 1 RN FTE/1,000 patient days	1	-1.29	0.54	0.076	
Estimated Increase by 1 RN FTE/patient day					
All studies	8	-1.18	0.49	0.02	<0.001
ICUs	3	-0.97	0.28	<0.001	0.23
Surgical patients	5	-0.89	0.49	0.08	<0.001
Medical patients	3	-1.18	0.78	0.15	<0.001
Hospital level analysis	3	-3.48	2.68	0.25	0.67
Patient level analysis	5	-1.18	0.55	0.04	<0.001

Table 5. RN to patient ratios and relative risk* of hospital-related mortality (pooled adjusted estimates from published studies)

Level of Analysis	Number of Studies	Relative Risk	95% CI	p Value for the Association	Consistency
Authors' definition of nurse to patient ratio					
Increase by patient/RN/shift	6	1.08	1.07; 1.09	<.0001	No
Increase by 1 RN FTE/patient day	6	0.943	0.93; 0.953	<.0001	Yes
Increase by 1 RN FTE/1,000 patient days	3	0.995	0.95; 1.04	0.8273	Yes
Estimated Increase by 1 RN FTE/patient day					
All studies	14	0.92	0.90; 0.94	<.0001	No
Patient level analysis	8	0.919	0.89; 0.95	0.0002	No
Hospital level analysis	5	0.958	0.94; 0.98	0.0001	Yes
ICUs	5	0.908	0.86; 0.96	0.0321	Yes
Surgical patients	8	0.84	0.80; 0.89	<.0001	Yes
Medical patients	6	0.944	0.94; 0.95	<.0001	Yes
Quartiles of patients/RN/shift ratio					
<2 vs. 2-4	14	0.94	0.92; 0.95	<.0001	Yes
<2 vs. 4-5.5		0.76	0.71; 0.81	<.0001	Yes
<2 vs. >6		0.62	0.59; 0.66	<.0001	Yes
2-4 vs. 4-5.5		0.81	0.76; 0.87	<.0001	Yes
2-4 vs.>6		0.66	0.63; 0.70	<.0001	Yes
4-5.5 vs. >6		0.82	0.76; 0.88	<.0001	Yes
ICUs	5				
<3 vs. 3-4		0.94	0.92; 0.97	0.016	Yes
Medical patients	6				
<2 vs. 2-4		0.94	0.92; 0.96	<.0001	Yes
Surgical patients	8				
<2 vs. 4-6		0.76	0.70; 0.82	0.000	Yes
<2 vs. >6		0.62	0.58; 0.66	<.0001	Yes
2-3.5 vs. 4-6		0.80	0.74; 0.87	0.001	Yes
2-3.5 vs. >6		0.65	0.61; 0.70	<.0001	Yes
4-6 vs. >6		0.81	0.75; 0.88	0.001	Yes

* Relative risk of outcomes - the ratio of the incidence rate of outcomes corresponding to different nurse staffing levels (relative risk =1 means no association, <1 – protective effect of increased nurse staffing, >1 – increased probability of patient outcomes). 95% CI – ranges of relative risk with 95% confidence that we will have the same results repeating the study many times in the same population.

Figure 5. Relative risk of patient hospital-related mortality corresponding to change in registered nurse to patient ratio (pooled estimation from the studies)

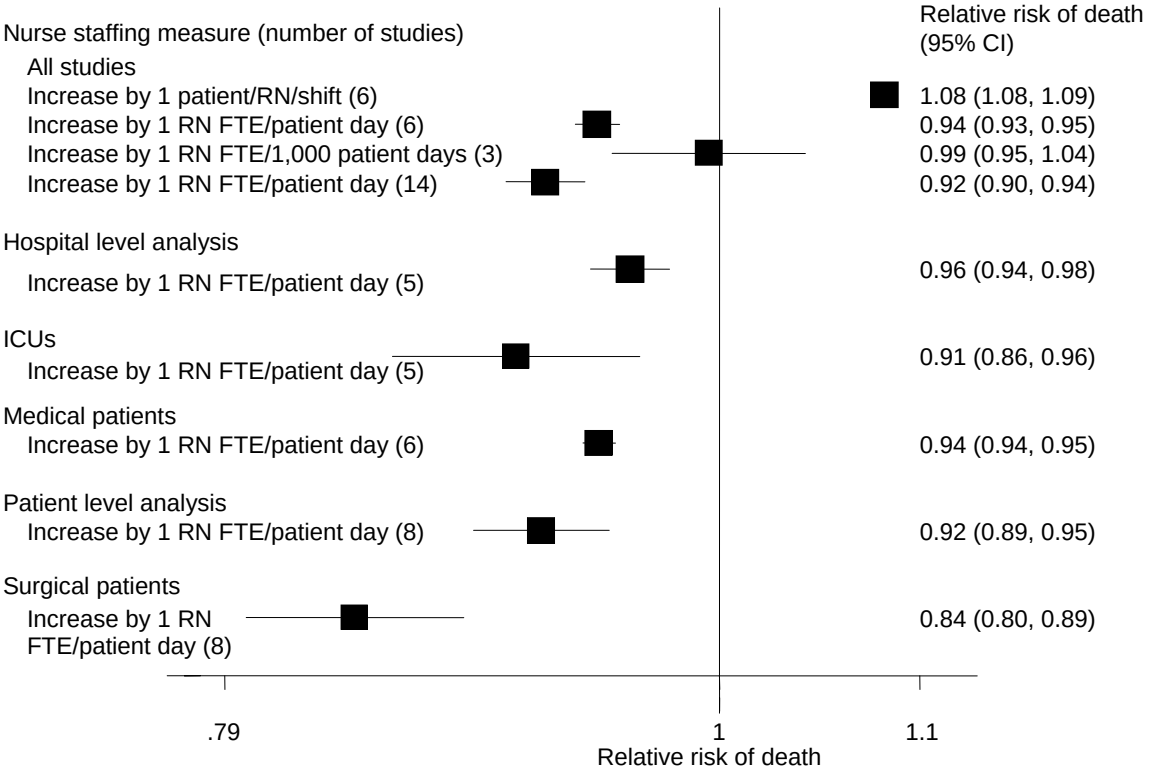


Figure 6. Relative risk of death among different categories of patients/RN/shift (pooled analysis)

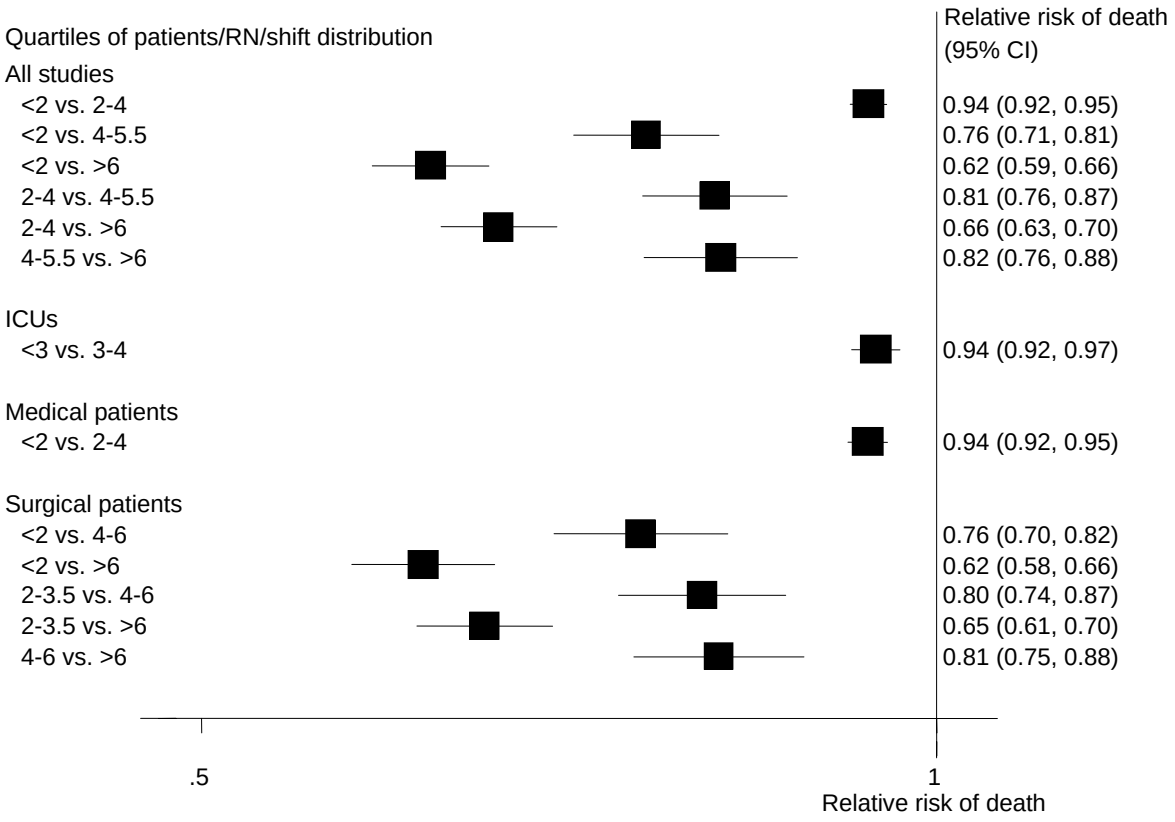


Table 6. Number of avoided deaths/1,000 hospitalized patients attributable to RN FTE/patient day ratio (pooled adjusted estimates from published studies)

Level of Analysis	Studies	RR	95% CI	Attributable to Nurse Staffing, Percentage of Death, 95% CI	NNT*	Number of Avoided deaths/1,000 Hospitalized, 95% CI
Authors' definitions of nurse staffing ratio						
Increase by patient/RN/shift	6	1.08	1.07; 1.09	7.6 (7.07; 8.04)	198	5 (4; 5)
Increase by 1 RN FTE/patient day	6	0.94	0.93; 0.95	6 (7; 5)	162	6 (5; 7)
Estimated increase by 1 RN FTE/patient day						
All studies	14	0.92	0.90; 0.94	8 (10; 6)	191	5 (4; 6)
Patient level analysis	8	0.92	0.89; 0.95	8 (11; 5)	154	7 (4l 9)
Hospital level analysis	5	0.96	0.94; 0.98	4 (6; 2)	342	3 (2; 4
Intensive care units	5	0.91	0.86; 0.96	9 (14; 4)	187	5 (2; 8)
Surgical patients	8	0.84	0.80; 0.89	16 (20; 12)	164	6 (4; 8)
Medical patients	6	0.94	0.94; 0.95	6 (6; 5)	211	5 (4; 5)
Quartiles of patients/RN/shift ratio						
<2 vs. 2-4	14	0.94	0.92; 0.95	6 (8; 5)	247	4 (3; 5)
<2 vs. 4-5.5		0.76	0.71; 0.81	24 (29; 19)	63	16 (12; 19)
<2 vs. >6		0.62	0.59; 0.66	38 (41; 35)	40	25 (23; 28)
2-4 vs. 4-5.5		0.81	0.76; 0.87	19 (24; 13)	80	12 (9; 16)
2-4 vs. >6		0.66	0.63; 0.70	34 (37; 30)	45	23 (20; 25)
4-5.5 vs. >6		0.82	0.76; 0.88	18 (24; 12)	83	12 (8; 16)
ICUs	5					
<3 vs. 3-4		0.94	0.92; 0.97	6 (8; 3)	308	3 (2; 5)
Medical patients	6					
<2 vs. 2-4		0.94	0.92; 0.96	6 (8; 5)	187	5 (4; 7)
Surgical patients	8					
≤2 vs. 4-6		0.76	0.70; 0.82	24 (30; 18)	107	9 (7; 12)
≤2 vs. >6		0.62	0.58; 0.66	38 (42; 34)	68	15 (13; 16)
2-3.5 vs. 4-6		0.80	0.74; 0.87	20 (26; 13)	132	8 (5; 10)
2-3.5 vs. >6		0.65	0.61; 0.70	35 (39; 30)	75	13 (12; 15)
4-6 vs. >6		0.81	0.75; 0.88	19 (25; 12)	141	7 (5; 10)

* Number needed to treat to generate benefit (saved life)

Table 7. Calculated relative risk of hospital-related mortality corresponding to increased RN staffing (results from individual studies)

Study, Analytic Unit	RR	95% CI	Data, Definition of RN Ratio	Units	Patients	Diagnosis
Hospital						
Mark, 2004[18]	1.02	0.9; 1.1	Administrative, RN FTE/1,000 patient days	Combined	Combined	Combined
Mark, 2005[19]	1.005	0.98;1.03	Administrative, RN FTE/1,000 patient days	Combined	Combined	Combined
Robertson, 1999[11]	0.97	0.957; 0.98	Administrative, RN FTE/patient day	Combined	Medical	Chronic obstructive pulmonary disease
Silber, 2000[12]	0.93*	p <0.05	Administrative, RN FTE/patient day	Surgical	Surgical	Combined
Elting, 2005[20]	0.61*	p <0.05	Administrative, RN FTE/patient day	Surgical	Surgical	Bladder carcinoma (ICD-9 codes 188.0 - 188.9 and 236.7) after total cystectomy
Patient						
Aiken, 1999[10]	0.28	0.2; 0.5	Medical records, RN FTE/patient day	Combined	Medical	AIDS
Aiken, 2002[15]	0.58	0.4; 0.8	Administrative, RN FTE/patient day	Combined	Surgical	General surgical, orthopedic, or vascular operation
Aiken. 2003[16]	0.89	0.848; 0.934	Administrative, RN FTE/patient day	ICU	Surgical	General surgical, orthopedic, vascular operation
Person, 2004[17]	0.94	0.9; 1	Administrative, RN FTE/patient day	Combined	Medical	Acute myocardial infarction
Pronovost, 1999[9]	0.02*	p <0.05	Administrative, patients/RN/shift	ICU	Medical	Abdominal aortic surgery
Amaravadi, 2000[13]	0.39*	NS	Administrative, patients/RN/shift	ICU	Surgical	Esophageal resection
Dimick, 2001[14]	6.5*	NS	Administrative, patients/RN/shift	ICU	Surgical	Hepatic resection
Halm, 2005[21]	1.02*	NS	Administrative, patients/RN/shift	Surgical	Surgical	General, orthopedic, and vascular surgery
Hospital unit						
Shortell, 1994[8]	1.13*	NS	Administrative, RN FTE/patient day	ICU	Medical	Combined

* 95% CI were not reported, significance reported by authors

Table 8. Association between RN staffing ratio and mortality and proportion of mortality attributable to nurse staffing (results from individual studies)

Author	Analytic Unit	Hospital Unit	Patients	RN Ratio	Relative Risk of Death (95% CI)	Attributable Proportion, (95% CI)
Pronovost[9]	P	ICU	S, Abdominal aortic surgery	Nurse to patient ratio <1:2 vs. >1:2 in evening	1.9 (1.2; 3)	0.47 (0.17; 0.23)
Aiken[10]	P	C	M, AIDS	Increase by 1 patient/RN/shift	2.3 (1.3; 4.2)	0.57 (0.76; 0.22)
Aiken[15]	P	ICU	S, general surgical, orthopedic, or vascular operation	Increase in workload of 1 patient/RN/shift	1.06 (1.01; 1.1)	0.06 (0.01; 0.09)
Aiken[16]	P	ICU	S, general surgical, orthopedic, or vascular operation	Increase by 6 patients/RN/shift	1.5 (1.19; 1.97)	0.33 (0.16; 0.49)
				Increase by 1 patient/RN/shift	1.07 (1.03; 1.12)	0.07 (0.03; 0.11)
Person[17]	P	C	M, acute, myocardial, infarction	4th quartile vs.1 quartile of RN staffing (~2.7 RN FTE/patient day vs. ~1.6 RN FTE/patient day)	0.91 (0.86; 0.97	0.10 (0.16; 0.03)
Elting[20]	H	S	S, bladder carcinoma after total cystectomy	Hospitals with few RN FTE/occupied bed (median 1.4) vs. many (median 3.1)	2.04 (1.03; 5.3)	0.51 (0.81; 0.03)
Mark[19]	H	C	C	Increase by 1 RN FTE/1,000 patient days in hospitals with high HMO penetration	0.91 (0.86; 0.95)	0.10 (0.16; 0.05
Robertson[11]	H	C	M	Increase by 1 RN in RN FTE/patient day ratio in 1989	0.988	0.01
				1990	0.987	0.01
				1991	0.978	0.02
Mark[18]	H	C	C	75th quartile of RN FTE/1,000patient-days 7.24 RN hours/patient day	0.96 (0.95; 0.98)	0.04 (0.05; 0.02)
				50th quartile of RN FTEs/1,000 patient days 6.01 RN hours/patient day	0.97 (0.96; 0.98)	0.03 (0.04; 0.02)
				25th quartile of RN FTEs/1,000 patient days 4.79 RN hours/patient day	0.98 (0.96; 0.99)	0.02 (0.04; 0.01)
				Increase by 1 RN FTE/1,000 patient days	0.92 (0.87; 0.96)	0.09 (0.15; 0.04)
Silber[12]	H	S	S	Hospitals with 1.6 vs. 2.7 patients/RN/shift	0.95 (0.93; 0.96)	0.05 (0.08; 0.04)

P = patient; H = hospital; C = combined; S = surgical; M = medical; Attributable Proportion = proportion of deaths attributable to nurse staffing

Table 9. Correlation between nurse staffing and age adjusted fatal adverse events related to medical care at the state level[1,144,148]

	r	p Value
Excess or shortage	0.08	0.58
Percent of shortage	-0.10	0.50
Total number of nurses	-0.11	0.62
Employed in nursing	-0.11	0.59
Percent employed in nursing	-0.12	0.56
RN/100,000 population	-0.24	0.26
Full-time employed	-0.09	0.66
Percent full-time employed	0.13	0.55
Part-time employed	-0.13	0.55
Percent part-time employed	-0.10	0.62
RN FTE	-0.04	0.84
Number of nurses with diploma	-0.04	0.86
Percent of nurses with diploma	-0.10	0.64
Number of nurses with associate degree	0.33	0.11
Percent of nurses with associate degree	0.33	0.11
Number of nurses with BSN	-0.15	0.48
Percent of nurses with BSN	-0.46*	0.02
Number of nurses with MS and PhD	-0.14	0.52
Percent of nurses with MS and PhD	0.16	0.46

* significant at 95% level
r = correlation coefficient

Table 10. Association between nurse education, experience, and mortality

Author, Unit, Patients	Nurse Education and Experience	Death Rate, %	Relative Risk, 95% CI
Aiken[16]	40% of hospital workforce with BSN or higher	2.17	
ICU	10% increase in nurses with BSN degree*	-0.10	0.95 (0.9; 0.99)
Surgical	Increase by 1 year in nurse experience	0.23	0.09
	Interactions:		
	60% of hospital workforce with BSN or higher, 8 patients/day	1.98	
	40% of hospital workforce with BSN or higher, 4 patient/nurse	1.80	
	20% of hospital workforce with BSN or higher, 4 patients/nurse	1.97	
	60% of hospital workforce with BSN or higher, 6 patients/nurse	1.80	
	40% of hospital workforce with BSN or higher, 6 patients/nurse	1.98	
	20% of hospital workforce with BSN or higher, 6 patients/nurse	2.16	
	60% of hospital workforce with BSN or higher, 4 patients/nurse	1.64	
	20-29% of hospital workforce with BSN or higher, 14 years of nurse experience	2.20	
	<20% of hospital workforce with BSN or higher, 15 years of nurse experience	2.30	
	20% of hospital workforce with BSN or higher, 8 patients/nurse	2.38	
	>50% of hospital workforce with BSN or higher, 12.5 years of nurse experience	1.70	
	40-49% of hospital workforce with BSN or higher, 14.3 years of nurse experience	1.90	
	30-39% of hospital workforce with BSN or higher, 14 years of nurse experience	1.80	
Estabrooks[101]	Hospitals with higher proportion of nurses with BSN 36% vs. low (11%)		0.81 (0.68; 96)
Combined	Hospitals with higher proportion of nurses with BSN, 36% vs. low (11%) (random effects model)		0.65 (0.6; 0.71)
Medical			
Tourangeau[140]	Increase by 1 year in nursing experience in teaching hospitals		0.99
Combined	Increase by 1 year in nurse experience		0.99
Medical	Increase by 1 year in nursing experience in nonurban hospitals		1
	30 days mortality in teaching hospitals, 7.85 years of nurse experience	14.02	
	30 days mortality in nonurban community hospitals, 9.47 years of nurse experience	15.27	
	30 days mortality in urban community hospitals, 8.9 years of nurse experience	15.05	

*We calculated death rate corresponding to 10% increase in nurses with BSN and to 1 year increase in nurse experience, significant at 95% level.

Table 11. Patient outcomes rates (%) corresponding to an increase in RN staffing ratios (pooled estimation from the published studies)

Outcomes	Studies	Difference in Rate, %	Standard Error	p Value for the Association	Consistency
Authors' definition of nurse staffing ratio Increase by 1 patient/RN/shift					
Failure to rescue	1	0.35	0.12	0.01	
CPR	3	0.45	0.06	0.001	No
Falls	2	3.88	1.26	0.05	Yes
Urinary tract infection	2	-0.71	0.41	0.10	Yes
Pneumonia	2	2.04	1.62	0.43	Yes
Nosocomial Infection	5	-0.03	0.08	0.68	No
Pressure ulcers	2	-1.26	0.41	0.06	No
Pulmonary failure	3	6.54	1.04	0.001	Yes
Unplanned extubation	3	4.20	0.31	0.001	No
Estimated increase by 1 RN FTE/patient day					
Failure to rescue	3	-0.67	0.20	0.001	No
Falls	3	-13.43	1.55	0.001	No
Urinary tract infection	3	5.18	1.94	0.02	Yes
Pneumonia	2	-3.57	2.84	0.43	Yes
Nosocomial Infection	6	0.23	0.40	0.57	No
Pressure ulcers	2	3.94	1.11	0.04	No
Pulmonary failure	4	-0.03	0.02	0.11	Yes
Unplanned extubation	3	-7.35	0.55	0.001	No
Thrombosis	1	-0.05	0.04	0.29	
Estimated increase by 1 RN FTE/patient day in ICUs					
Failure to rescue	1	-3.69	1.26	0.01	
CPR	3	-0.78	0.10	0.002	No
Pulmonary failure	3	-11.45	1.82	0.003	Yes
Unplanned extubation	3	-7.35	0.55	0.001	No
Estimated increase by 1 RN FTE/patient day in surgical patients					
Failure to rescue	2	-3.32	1.25	0.02	Yes
CPR	3	-0.78	0.10	0.002	No
Sepsis	5	-1.15	0.42	0.02	No

Table 12. Relative risk of patient outcomes corresponding to an increase in RN staffing ratios (pooled estimation from the studies)

Outcomes	Studies	Relative Risk	95% CI	p Value for the Association	Consistency
Authors' definition of nurse staffing ratio					
Increase by 1 patient/RN/shift					
Hospital acquired pneumonia	3	1.07	1.03; 1.11	0.001	Yes
Failure to rescue	3	1.08	1.07; 1.09	<.0001	No
Pulmonary failure	4	1.53	1.24; 1.89	0.001	Yes
Unplanned extubation	5	1.45	1.27; 1.67	<.0001	Yes
Nosocomial infection	3	1.03	0.98; 1.07	0.24	No
CPR	3	1.16	1.05; 1.29	0.008	Yes
Medical complications	3	1.17	1.04; 1.31	0.01	Yes
Increase by 1 RN FTE/patient day					
Failure to rescue	2	0.92	0.92; 0.92	0.002	No
Estimated increase by 1 RN FTE/patient day					
ICU					
Hospital acquired pneumonia	3	0.7	0.56; 0.88	0.02	Yes
Pulmonary failure	4	0.4	0.27; 0.59	0.001	Yes
Unplanned extubation	5	0.49	0.36; 0.67	0.001	Yes
CPR	3	0.72	0.62; 0.84	0.002	Yes
Medical complications	3	0.72	0.6; 0.86	0.005	Yes
Surgical patients					
Urinary tract infection	1	1.68	1.06; 2.67	0.05	
Failure to rescue	5	0.84	0.79; 0.9	0.001	Yes
Nosocomial infection	2	0.08	0.04; 0.18	<.0001	No
Surgical wound infection	1	0.15	0.03; 0.82	0.051	
Sepsis	5	0.64	0.46; 0.89	0.015	Yes
Patient level analysis					
Failure to rescue	4	0.91	0.89; 0.94	0.002	Yes
Pulmonary failure	5	0.94	0.94; 0.94	<.0001	Yes

Figure 7. Patient outcomes rates (%) corresponding to an increase by patient per LPN/LVN per shift (calculated from one study)

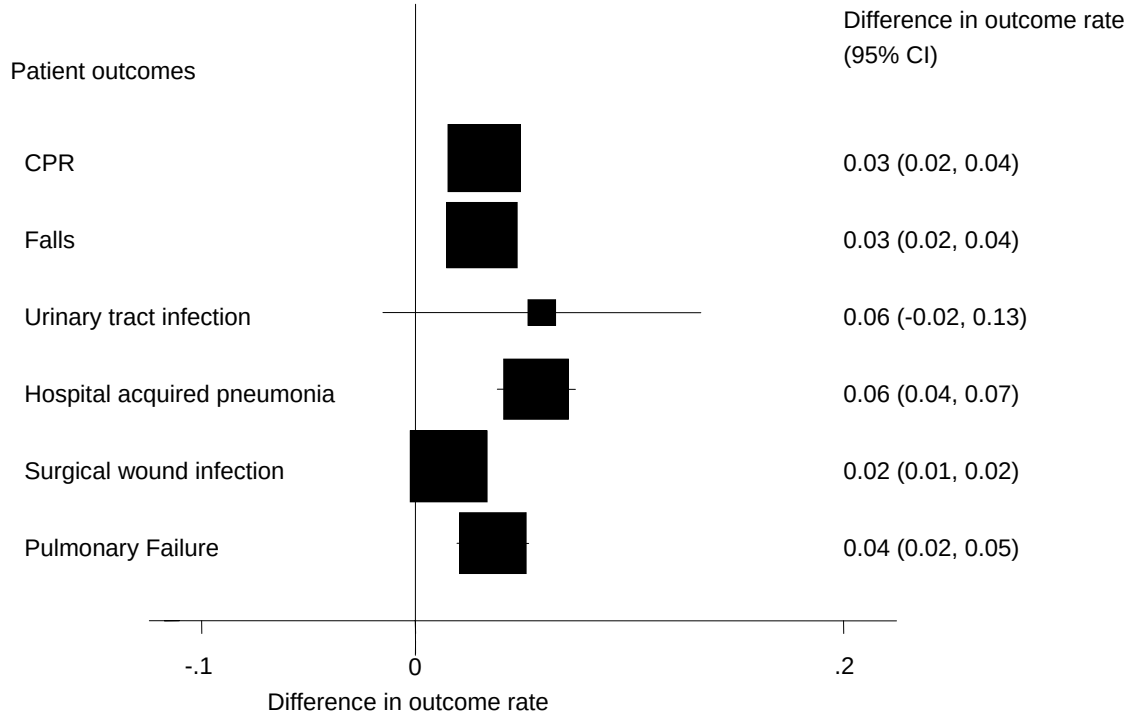


Figure 8. Patient outcomes rates (%) corresponding to an increase by patient/UAP/shift (estimates from individual studies and pooled analysis)

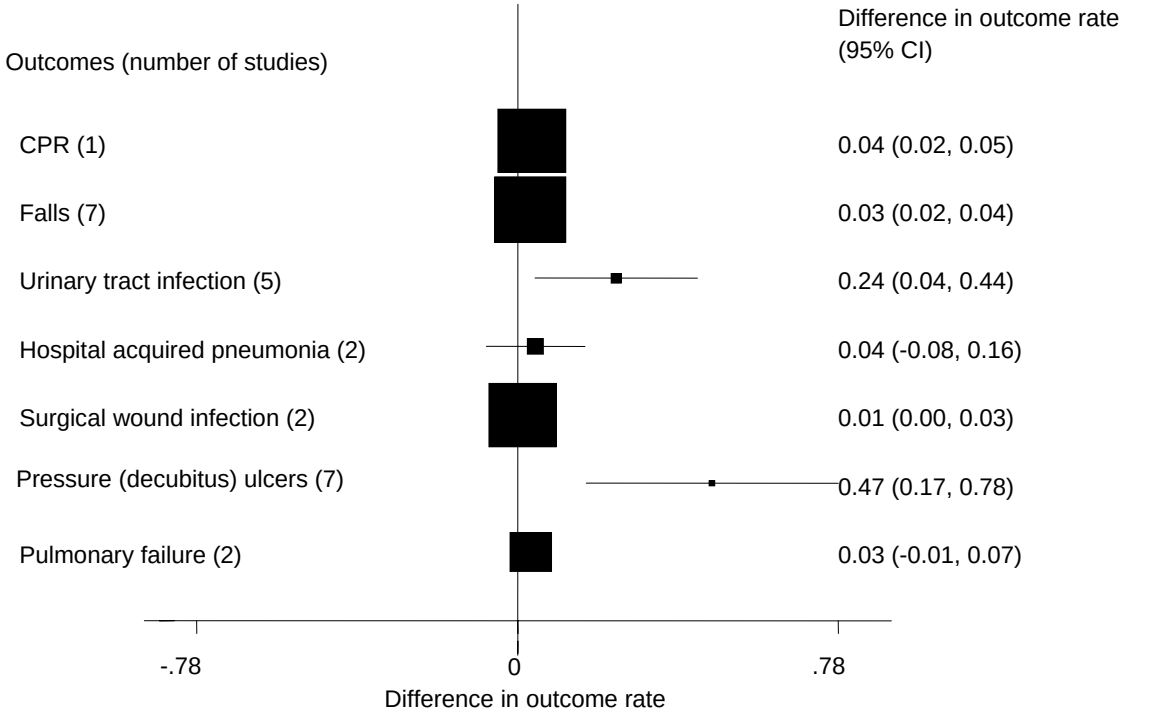


Table 13. Length of stay corresponding to an increase in RN staffing ratios (pooled analysis)

Nurse Staffing	Studies	Change in Length of Stay, Days	Standard Errors	p Value for the Association	Consistency
Authors' definitions					
Increase by 1 patient/RN/shift	6	0.7	0.8	0.4	Yes
Increase by 1 RN FTE/patient day	2	-0.25	0.03	<.0001	Yes
Estimated increase by 1 RN FTE/patient day					
All studies	10	-0.25	0.02	<.0001	No
ICUs	5	-0.70	1.64	0.68	Yes
Surgical patients	5	-0.63	1.50	0.68	Yes
Medical patients	5	-0.25	0.02	<.0001	No

Figure 9. Relative changes in LOS corresponding to an increase in RN staffing ratios (pooled estimation from the studies)

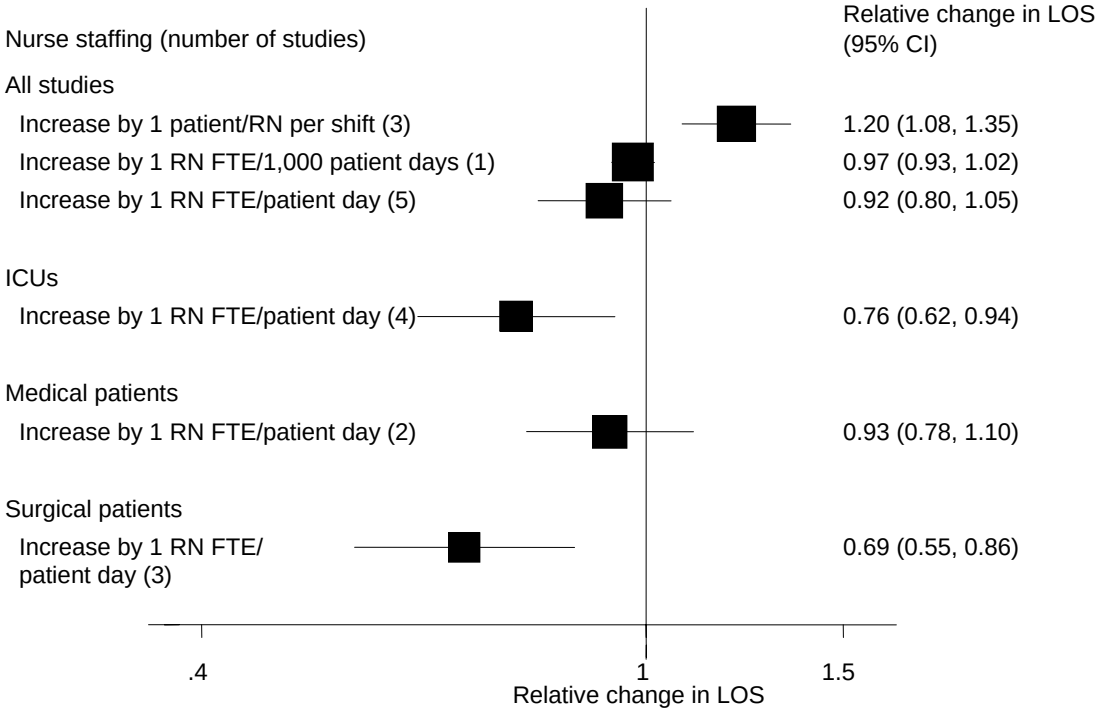
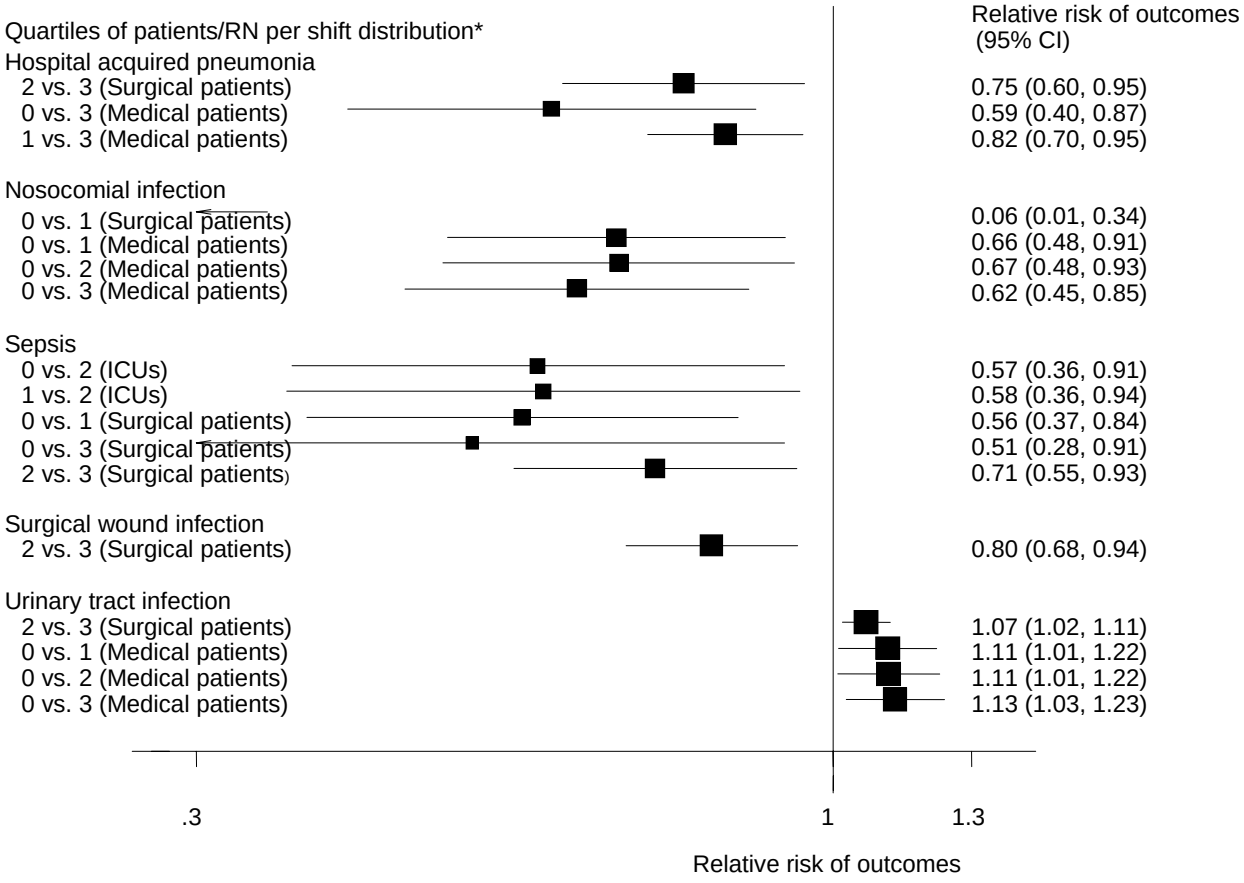


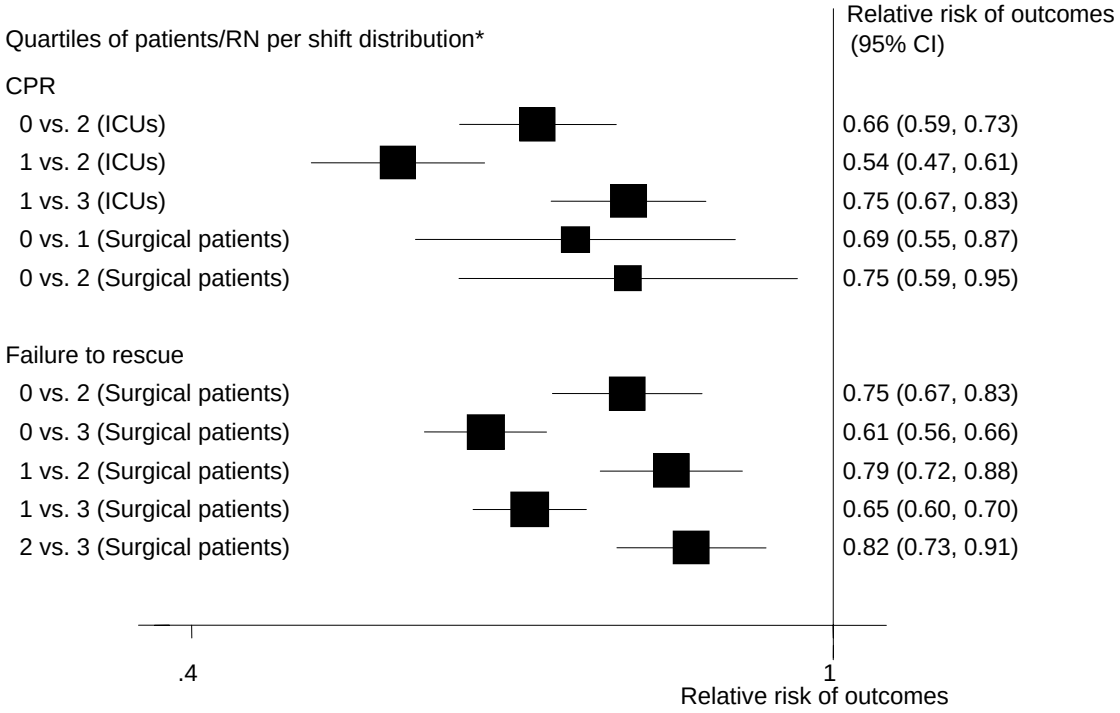
Figure 10. Relative risk of hospital acquired infections in quartiles of patients/RN/shift distribution (pooled analysis)



*The following table shows how the patients/RN/shift quartiles were established.

Quartiles	ICU	Surgical Patients	Medical Patients
0	<1.6	<2	<2
1	2.0	2.8	3.0
2	3.3	4.9	4.8
3	>4	>5	>6

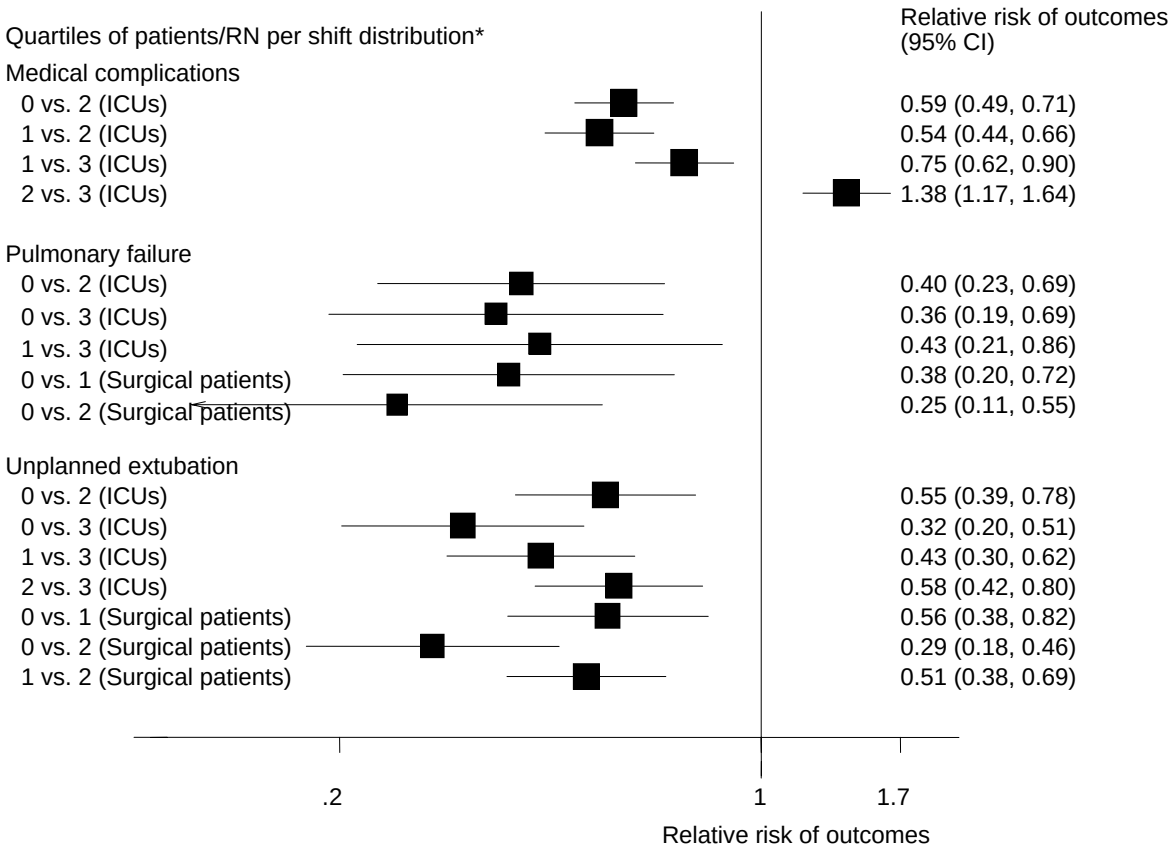
Figure 11. Relative risk of patient outcomes in quartiles of patients/RN/shift distribution (pooled analysis)



*The following table shows how the patients/RN/shift quartiles were established.

Quartiles	ICU	Surgical Patients
0	<1.6	<2
1	2.0	2.8
2	3.3	4.9
3	>4	>5

Figure 12. Relative risk of patient outcomes in quartiles of patients/RN/shift distribution (pooled analysis)



*The following table shows how the patients/RN/shift quartiles were established.

Quartiles	ICU	Surgical Patients
0	<1.6	<2
1	2.0	2.8
2	3.3	4.9
3	>4	>5

Table 14. Patient outcomes rates (%) corresponding to an increase by 1 hour in total nursing hours/patient day (pooled analysis)

Outcomes	Studies	Difference in Outcome Rate, %	Standard Error	p Value for the Association	Consistency
ICUs					
Falls	5	-0.08	0.01	<0.001	Yes
Nosocomial infection	4	-0.83	0.31	0.03	No
Sepsis	3	-0.24	0.47	0.63	Yes
Pressure ulcers	5	-0.90	0.65	0.30	Yes
Surgical patients					
Failure to rescue	2	-3.53	0.48	<.0001	Yes
Falls	3	0.12	0.07	0.16	Yes
Urinary tract infection	4	-4.23	0.97	0.001	Yes
Hospital acquired pneumonia	3	-2.20	0.52	0.002	Yes
Nosocomial infection	2	0.44	0.27	0.19	Yes
Sepsis	3	-1.33	0.27	0.001	Yes
Surgical wound infection	2	-0.31	0.05	0.000	Yes
Pressure ulcers	5	-2.26	0.34	<.0001	Yes
Gastrointestinal bleeding	2	-0.89	0.18	0.001	Yes
Shock	2	-0.77	0.14	0.000	Yes
Pulmonary failure	2	-2.39	0.49	0.001	Yes
Thrombosis	2	-0.45	0.11	0.002	Yes
Medical patients					
Failure to rescue	2	-1.39	0.50	0.02	Yes
Falls	11	-0.17	0.13	0.18	Yes
Urinary tract infection	7	-1.88	0.36	<.0001	Yes
Hospital acquired pneumonia	5	-0.89	0.27	0.004	Yes
Nosocomial infection	5	0.11	0.04	0.01	No
Sepsis	5	-0.06	0.05	0.25	Yes
Pressure ulcers	13	0.33	0.20	0.10	Yes
Gastrointestinal bleeding	2	-0.44	0.10	0.002	Yes
Shock	2	-0.34	0.05	<.0001	Yes
Thrombosis	2	-0.15	0.05	0.008	Yes

Figure 13. Relative risk of patient outcomes corresponding to an increase by 1 hour in total nursing hours/patient day

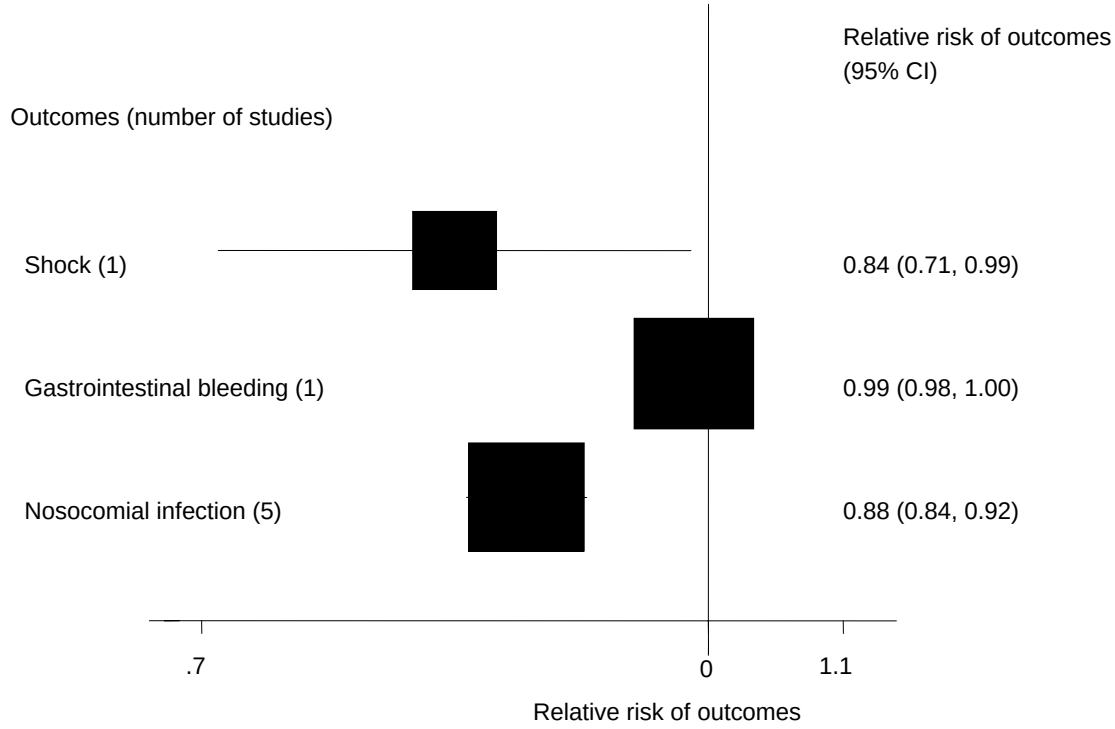


Table 15. Patient outcomes rates (%) corresponding to an increase by 1 hour in RN hours/patient day (pooled analysis reported by the authors and estimated RN hours/patient day)

Outcomes	Studies	Difference in Outcome Rate, %	Standard Error	p Value for the Association	Consistency
ICUs					
Failure to rescue	1	-0.46	0.16	0.013	
CPR	4	-0.10	0.01	0.001	No
Falls	4	-0.06	0.01	0.001	Yes
Urinary tract infection	1	1.55	1.12	0.397	Yes
Hospital acquired pneumonia	3	-0.46	0.25	0.210	Yes
Nosocomial infection	7	0.01	0.18	0.964	Yes
Sepsis	7	-0.10	0.07	0.168	Yes
Pressure ulcers	4	-0.19	0.48	0.760	Yes
Pulmonary failure	3	-1.43	0.23	0.003	Yes
Unplanned extubation	3	-0.92	0.07	0.000	No
Surgical patients					
Failure to rescue	4	-0.73	0.77	0.353	No
CPR	5	-0.10	0.01	0.001	No
Urinary tract infection	7	3.22	1.47	0.039	No
Hospital acquired pneumonia	6	1.15	0.70	0.114	No
Nosocomial infection	3	0.60	0.08	<.0001	Yes
Sepsis	7	0.73	0.45	0.120	No
Surgical wound infection	2	0.10	0.16	0.528	No
Pressure ulcers	4	-0.04	1.02	0.966	No
Gastrointestinal bleeding	2	0.53	0.48	0.303	No
Shock	2	0.43	0.40	0.312	No
Pulmonary failure	7	1.14	0.63	0.081	No
Unplanned extubation	3	-0.92	0.07	0.000	No
Thrombosis	4	0.20	0.15	0.203	No
Medical patients					
Failure to rescue	3	0.05	0.10	0.612	No
CPR	3	0.44	0.03	<.0001	No
Falls	11	0.33	0.05	<.0001	Yes
Urinary tract infection	9	1.61	0.34	<.0001	No
Hospital acquired pneumonia	6	0.66	0.17	0.000	No
Nosocomial infection	7	0.04	0.05	0.461	No
Sepsis	6	-0.22	0.09	0.023	Yes
Pressure ulcers	12	-1.06	0.32	0.002	No
Gastrointestinal bleeding	2	0.18	0.23	0.458	No
Shock	2	0.05	0.16	0.746	No
Pulmonary failure	2	0.01	0.01	0.280	Yes
Thrombosis	3	0.01	0.01	0.105	No

Figure 14. Relative risk of patient outcomes corresponding to an increase by 1 hour in RN hours/patient day (pooled analysis)

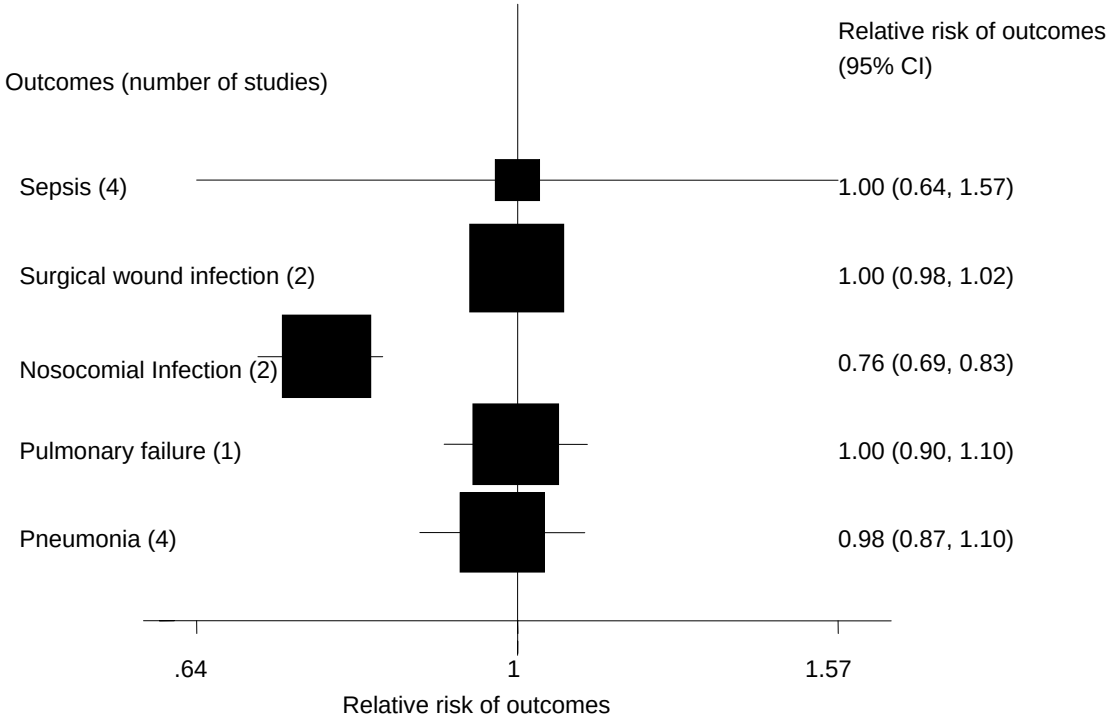


Figure 15. Relative risk of outcomes corresponding to an increase by 1 hour in RN hours/patient day (pooled analysis combined from reported and estimated hours)

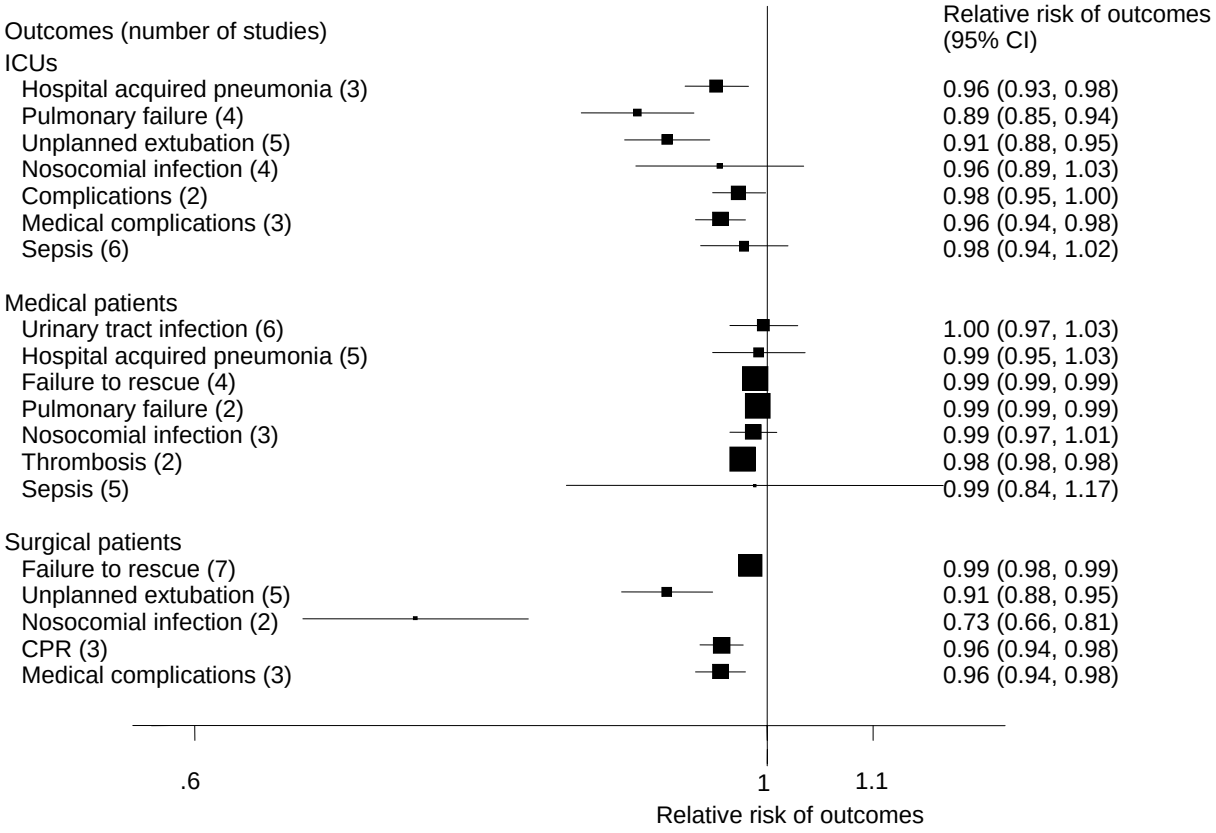


Table 16. Patient outcomes rates (%) corresponding to an increase by 1 hour in LPN/LVN hours/patient day (pooled analysis)

Outcomes	Studies	Difference in Outcome Rate,%	Standard Error	p Value for the Association	Consistency
Surgical patients					
Failure to rescue	2	2.68	1.22	0.05	Yes
Urinary tract infection	3	6.63	0.60	<.0001	Yes
Hospital acquired pneumonia	3	3.48	0.26	<.0001	Yes
Nosocomial infection	1	-2.70	4.61	0.62	
Sepsis	2	1.81	0.27	<.0001	Yes
Surgical wound infection	2	0.35	0.08	0.001	Yes
Pressure ulcers	2	2.60	0.60	0.002	Yes
Gastrointestinal bleeding	2	1.28	0.15	<.0001	Yes
Shock	2	1.04	0.15	<.0001	Yes
Pulmonary failure	3	3.31	0.31	<.0001	Yes
Thrombosis	3	0.67	0.06	<.0001	Yes
Medical patients					
Failure to rescue	2	1.25	0.89	0.19	Yes
CPR	2	-0.26	0.02	<.0001	Yes
Falls	3	-0.21	0.03	<.0001	Yes
Urinary tract infection	3	0.78	0.40	0.06	No
Hospital acquired pneumonia	3	0.81	0.28	0.01	No
Sepsis	2	-0.29	0.12	0.04	Yes
Pressure ulcers	7	-2.53	0.28	<.0001	No
Gastrointestinal bleeding	2	0.56	0.11	0.001	No
Shock	2	0.35	0.10	0.01	Yes
Pulmonary failure	1	-0.26	0.06	0.002	
Thrombosis	2	0.24	0.04	0.000	Yes

Figure 16. Patient outcomes rates (%) corresponding to an increase by 1 hour in UAP hours/patient day (pooled analysis)

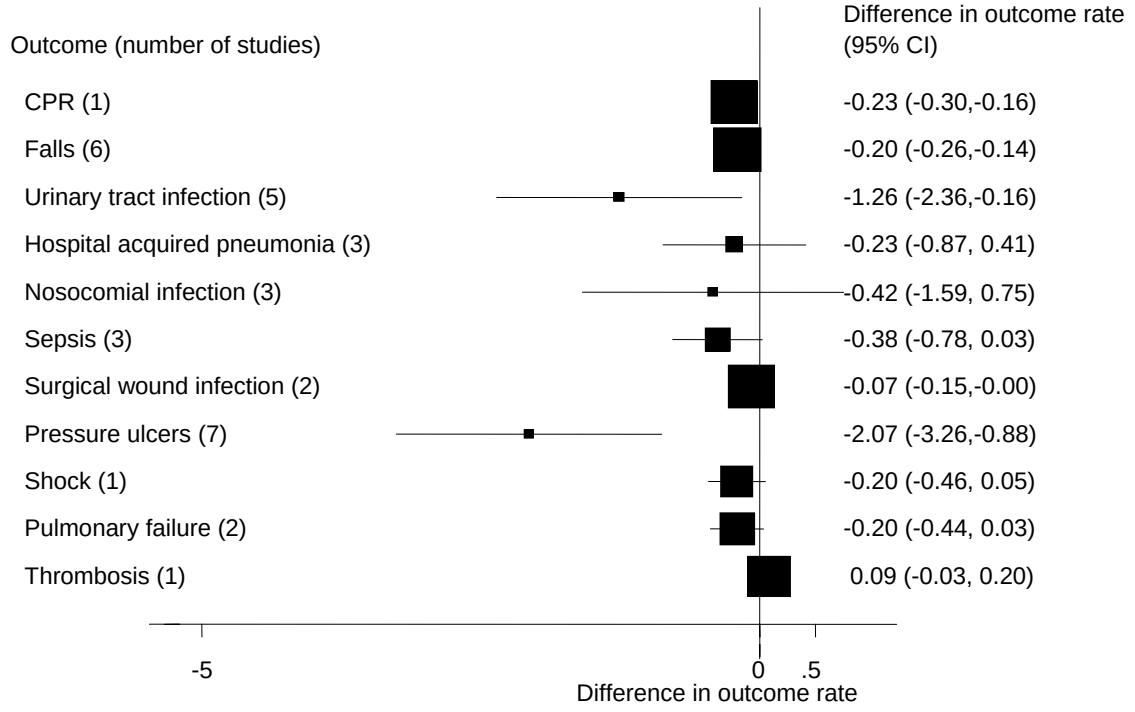


Figure 17. Changes in LOS corresponding to an increase by 1 nursing hour/patient day (pooled analysis)

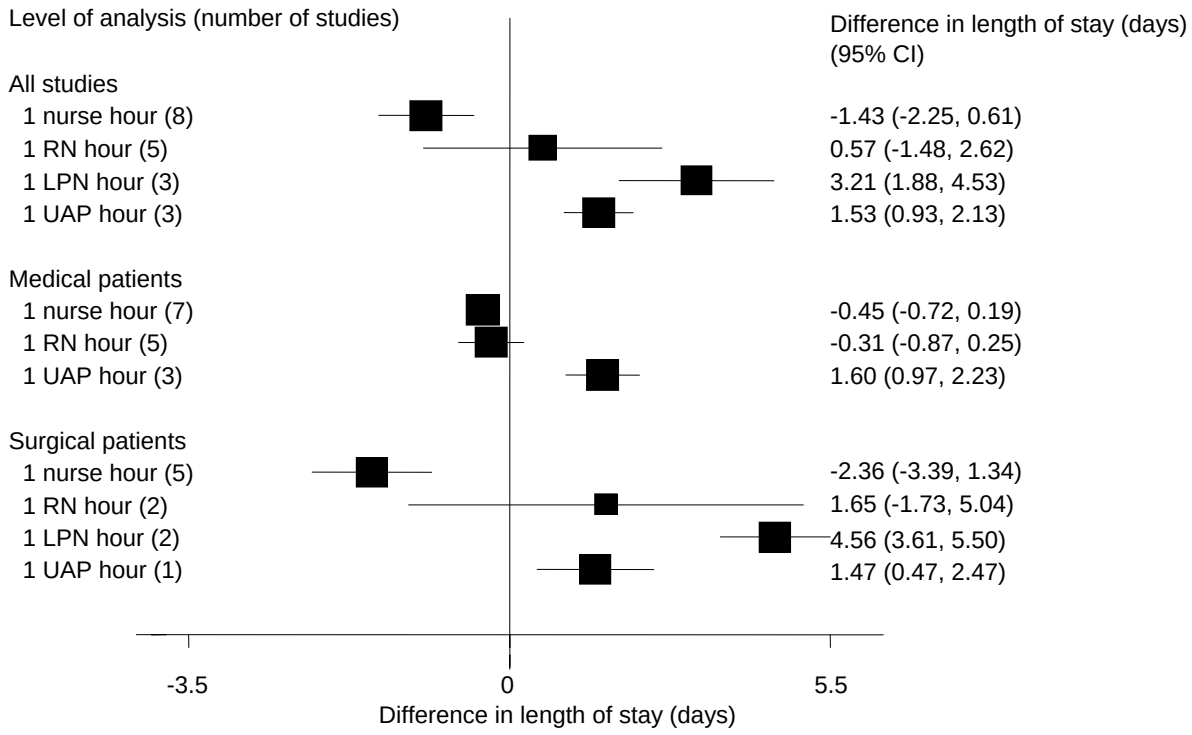


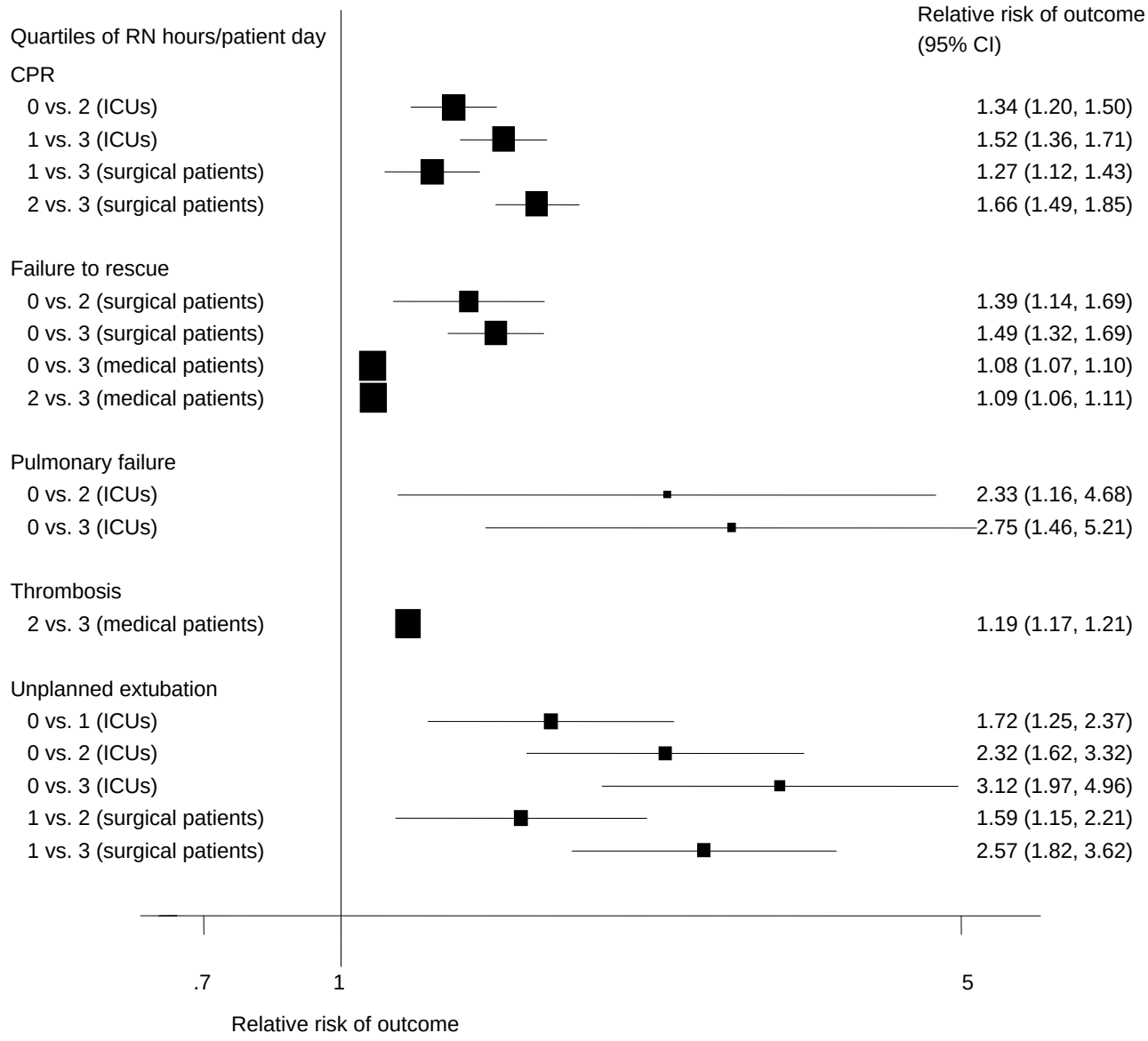
Table 17. Differences in outcomes rates (%) in quartiles of total nursing hours/patient day distribution (pooled analysis)

Quartiles	Outcomes	Difference in Rate, %	Standard Error	p Value for the Association	Consistency
ICUs					
1 vs. 2	Falls	0.76	0.22	0.02	Yes
1 vs. 3	Falls	0.59	0.10	0.002	
1 vs. 2	Nosocomial infection	7.24	1.97	0.01	No
2 vs. 3	Pressure ulcers	1.13	7.33	0.89	No
Surgical patients					
2 vs. 3	Failure to rescue	3.22	0.68	0.001	Yes
2 vs. 3	Surgical wound infection	0.29	0.05	0.00	Yes
2 vs. 3	Gastrointestinal bleeding	0.81	0.19	0.002	Yes
2 vs. 3	Shock	0.68	0.16	0.001	Yes
2 vs. 3	Pulmonary failure	2.17	0.50	0.001	Yes
2 vs. 3	Thrombosis	0.42	0.10	0.002	Yes
2 vs. 3	Falls	0.36	1.51	0.83	Yes
2 vs. 3	Urinary tract infection	4.10	0.85	0.000	Yes
0 vs. 2	Hospital acquired pneumonia	4.39	97.60	0.97	Yes
2 vs. 3	Hospital acquired pneumonia	2.01	0.53	0.003	
2 vs. 3	Sepsis	1.30	0.24	0.000	Yes
2 vs. 3	Pressure ulcers	2.31	0.31	<.0001	Yes
Medical patients					
2 vs. 3	Gastrointestinal bleeding	0.51	0.06	<.0001	Yes
2 vs. 3	Shock	0.36	0.04	<.0001	Yes
2 vs. 3	Thrombosis	0.17	0.03	0.000	Yes
1 vs. 3	Falls	7.62	1.55	<.0001	No
2 vs. 3	Falls	5.90	1.63	0.001	
2 vs. 3	Urinary tract infection	2.49	0.19	<.0001	Yes
2 vs. 3	Hospital acquired pneumonia	1.35	0.15	<.0001	Yes

The following table shows how quartiles of nurse hours were established.

Quartiles	ICU	Surgical Patients	Medical Patients
0	<6.32	<5.1	<5.6
1	8.3	6.2	7.0
2	12.1	9.5	9.6
3	>14.6	>11.37	>10.75

Figure 18. Relative risk of patient outcomes in quartiles of RN hours/patient day (pooled analysis of RN hours reported by the authors and estimated from RN ratios)



The following table shows how quartiles of nurse hours were established.

Quartiles	ICU	Surgical Patients	Medical Patients
0	<6	<4.2	<4
1	8.2	5.4	4.9
2	12.9	8.4	6.9
3	>16	>10.1	>8.1

Figure 19. Patient outcome rates corresponding to an increase in nurses' education and experience (results from individual studies)

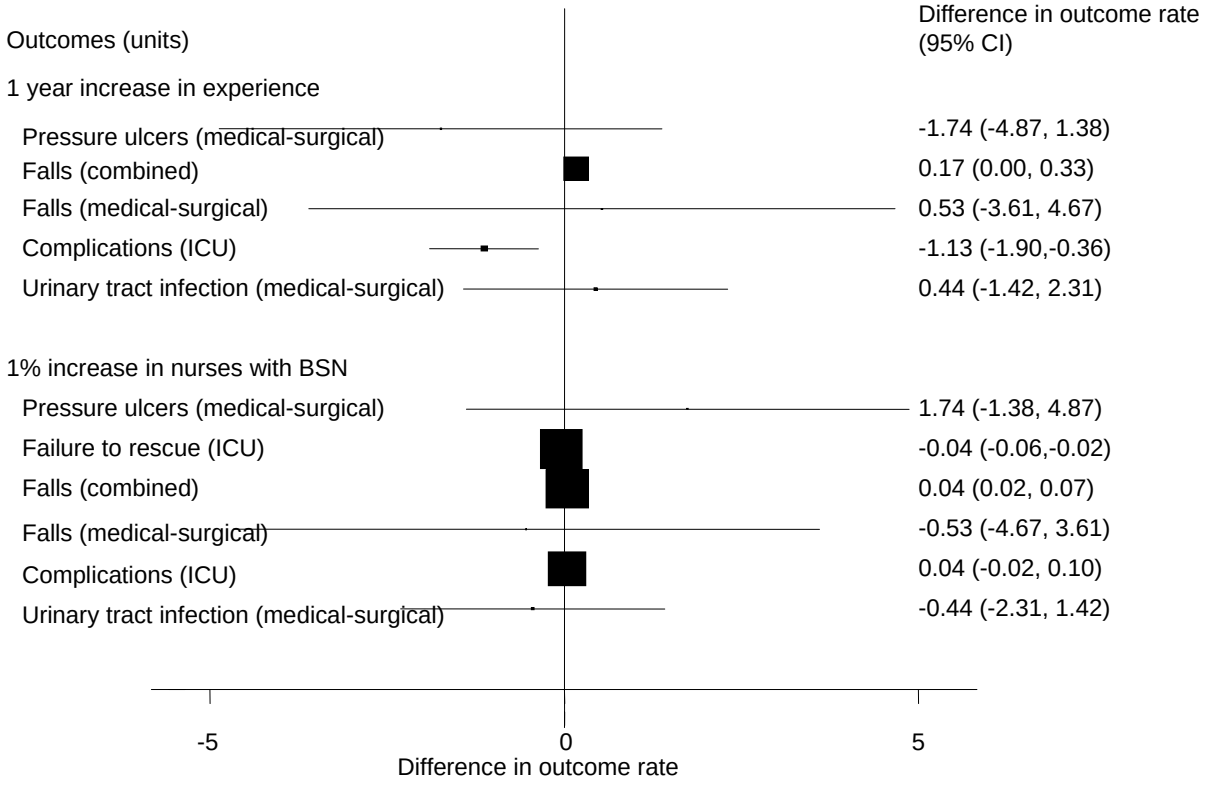


Table 18. The distribution of nurse skill and experience mix, nurse education, and proportion of temporary and full-time nurse hours

	Number of Studies	Mean	Standard Deviation	Median
% RN	48	69.4	17.1	71.0
% licensed nurses	8	81.1	7.5	86.0
% of nurses with BSN	9	39.7	17.9	41.1
Experience in years	12	10.1	2.8	10.0
% overtime hours	2	11.7	6.5	15.8
% temporary nurses	12	16.2	12.6	13.0
% full-time nurses	3	78.0	11.3	78.0

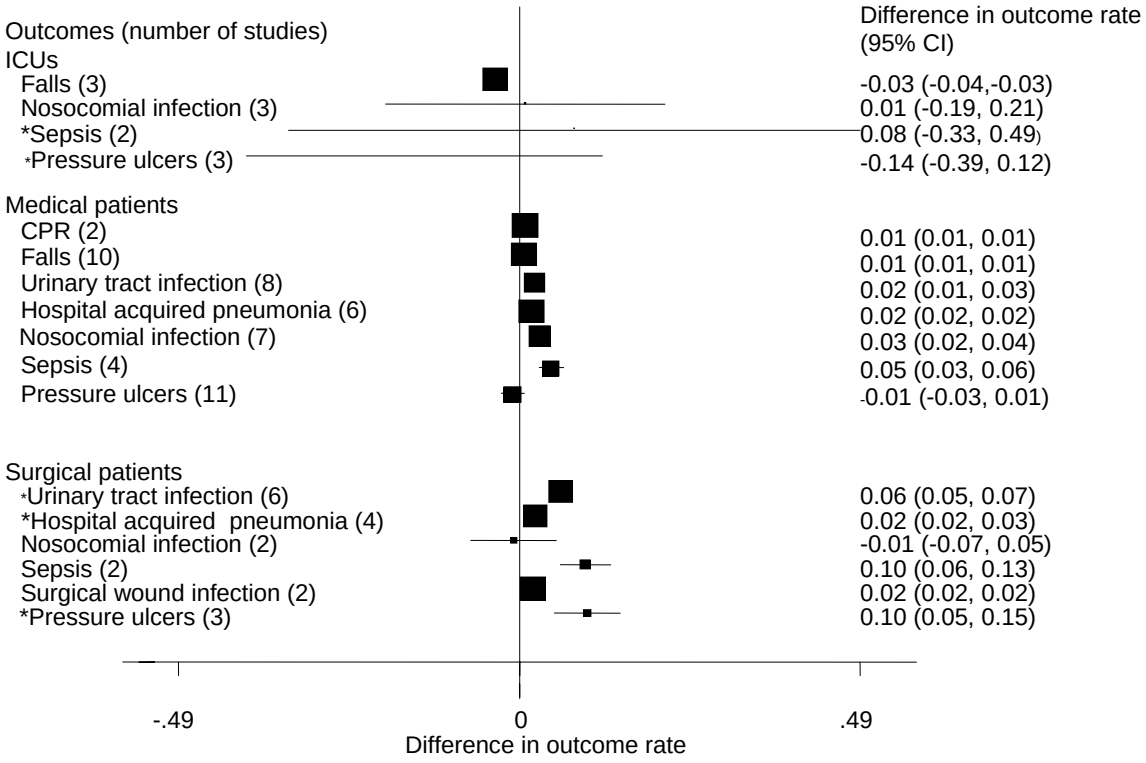
Table 19. Calculated changes in rates of patient outcomes corresponding to an increase by 1% in the proportion of RNs

Author, Analytic Unit	Hospital Unit	Patients	Outcome	Difference in Rate, %	95% CI
Hospital					
Krakauer[191]	Combined	Medical	Mortality	-0.095	-0.13; -0.06
Hartz[190]	Combined	Medical	Mortality	-0.387	-0.58; -0.19
Hospital and Patient					
Cho[28]	Combined	Medical	Mortality	0.085	-0.03; 0.20
Aiken[52]	Combined	Medical	Mortality	-0.001	-0.001; -0.001
Tourangeau[140]	Combined	Medical	Mortality	-0.086	-0.16; -0.01
Cho[28]	Combined	Surgical	Surgical wound infection	0.057	-0.01; 0.13
Cho[28]	Combined	Medical	Urinary tract infection	0.107	0.09; 0.12
Cho[28]	Combined	Medical	Pneumonia	-0.017	-0.02; -0.02
Cho[28]	Combined	Medical	Pressure ulcers	-0.024	-0.04; -0.004
Cho[28]	Combined	Medical	Falls	-0.001	-0.02; 0.02
Hospital and unit					
Needleman[26]	Combined	Medical and surgical	Sepsis	0.065	-0.22; 0.35
Patient					
Unruh[33]	Combined	Combined	Mortality	0.039	0.04; 0.04
Unruh[33]	Combined	Combined	Pulmonary failure	0.009	0.007; 0.01
Unruh[33]	Combined	Combined	Cardiopulmonary resuscitation	0.008	0.01; 0.01
Hope[22]	Medical and surgical	Medical and surgical	Nosocomial infection	0.000	-0.01; 0.01
Hope[22]	Medical and surgical	Medical and surgical	Urinary tract infection	0.082	-0.06; 0.22
Simmonds[192]	Specialized	Medical	Nosocomial infection	-0.546	-1.28; 0.20
Unruh[33]	Combined	Surgical	Surgical wound infection	0.004	0.004; 0.004
Unruh[33]	Combined	Combined	Pneumonia	0.019	0.02; 0.02
Unruh[33]	Combined	Combined	Urinary tract infection	0.051	0.02; 0.08
Zidek[36]	Combined	Medical	Pressure ulcers	0.015	-0.03; 0.06
Zidek[36]	Combined	Medical	Falls	0.002	-0.08; 0.08
Unruh[33]	Combined	Combined	Falls	0.007	0.001; 0.01
Seago[166]	Combined	Medical	Pressure ulcers	0.027	-0.10; 0.16
Seago[166]	Combined	Medical	Falls	0.020	-0.05; 0.09
Seago[154]	Combined	Medical	Falls	-0.047	-0.07; -0.02
Unit					
Blegen[29]	Combined, ICU, specialized	Medical and surgical	Mortality	-1.449	-3.4; 0.5
Ritter-Teitel[76]	Medical and surgical	Medical and surgical	Urinary tract infection	0.124	-0.83; 1.07
Stratton[193]	Combined, ICU, specialized	Medical and surgical	Nosocomial infection	0.033	0.02; 0.05
Blegen[29]	Combined, ICU, specialized	Medical and surgical	Nosocomial infection	-6.302	-8.16; -4.44
Ritter-Teitel[76]	Medical and surgical	Medical and surgical	Pressure ulcers	-0.111	-0.94; 0.72
Ritter-Teitel[76]	Medical and surgical	Medical and surgical	Falls	0.006	-0.24; 0.25
Blegen[29]	Combined, ICU, specialized	Medical and surgical	Pressure ulcers	-5.308	-6.32; -4.29

Table 19. Calculated changes in rates of patient outcomes corresponding to an increase by 1% in the proportion of RNs (continued)

Author, Analytic Unit	Hospital Unit	Patients	Outcome	Difference in Rate, %	95% CI
Blegen[29]	Combined, ICU, specialized	Medical and surgical	Falls	-0.015	-0.51; 0.48
Potter[75]	ICU	Medical	Falls	-0.048	-0.12; 0.06
Donaldson[64]	Step-down, Medical and surgical units	Medical and surgical	Pressure ulcers	0.121	-0.13; 0.37
Donaldson[64]	Step-down, Medical and surgical units	Medical and surgical	Falls	-0.059	-0.17; 0.01

Figure 20. Calculated changes in rates of patient outcomes corresponding to an increase by 1% in the proportion of RNs (pooled analysis)



*consistent across the studies (heterogeneity NS)

Figure 21. Relative risk of patient outcomes corresponding to an increase by 1% in the proportion of RNs (pooled analysis)

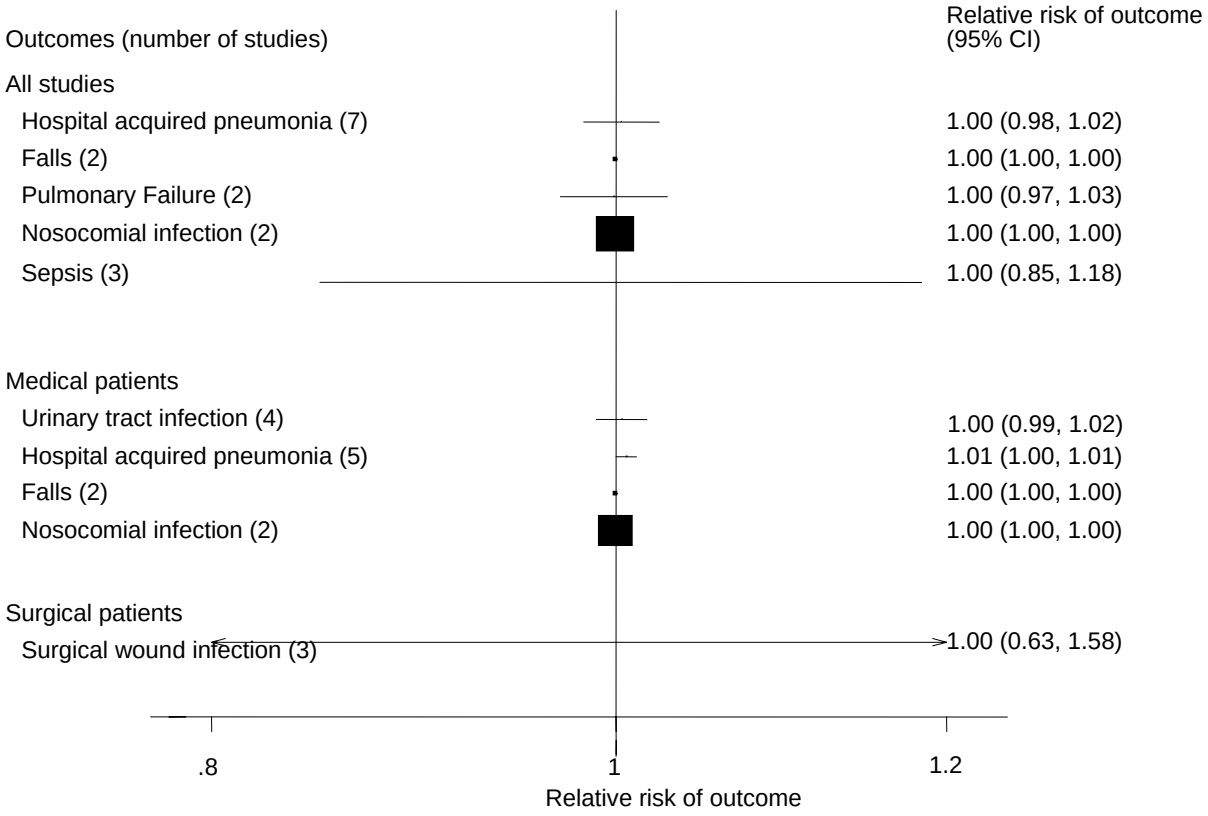


Figure 22. Relative risk of hospital related mortality and failure to rescue corresponding to an increase by 1% in the proportion of RNs (results from individual studies and pooled estimates)

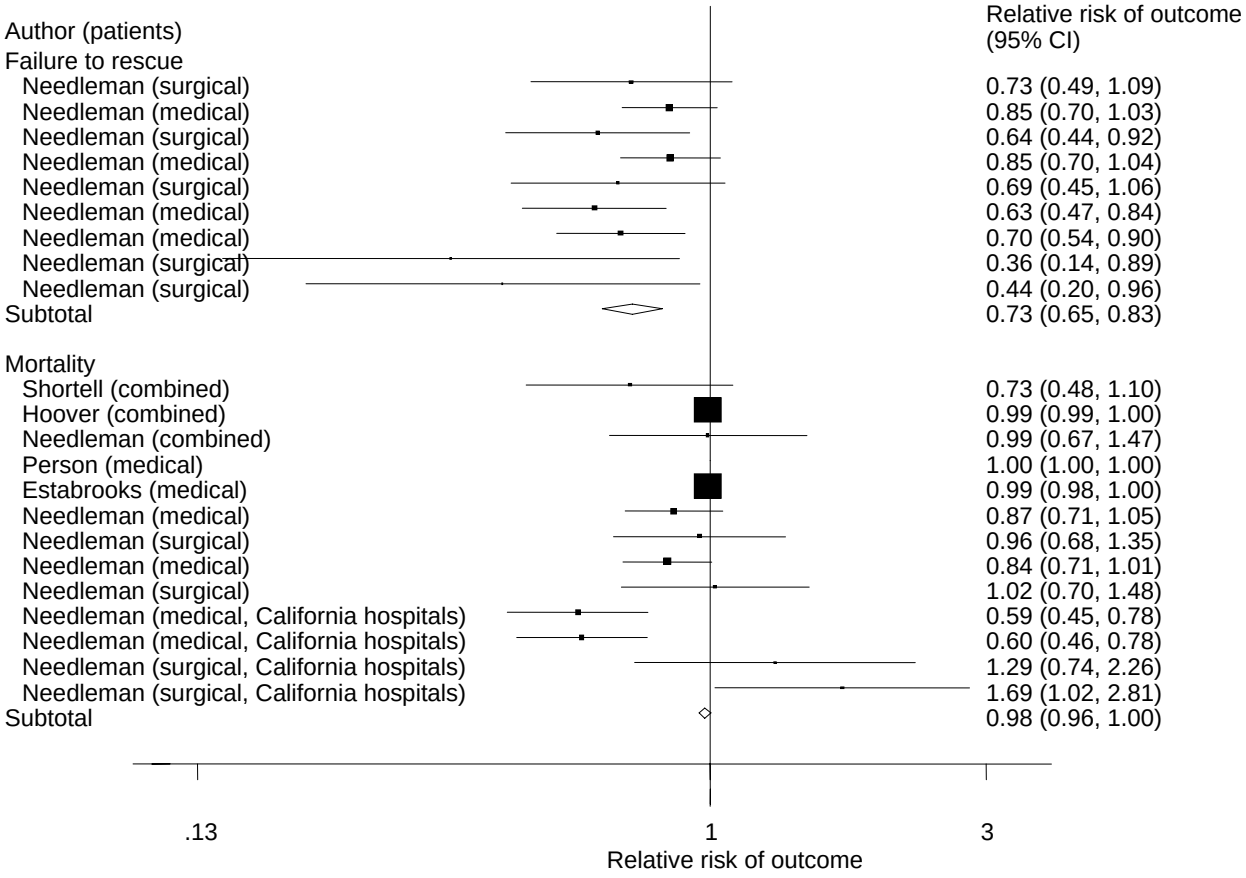


Figure 23. Relative risk of patient outcomes corresponding to an increase by 1% in the proportion of RNs (results from individual studies and pooled estimates)

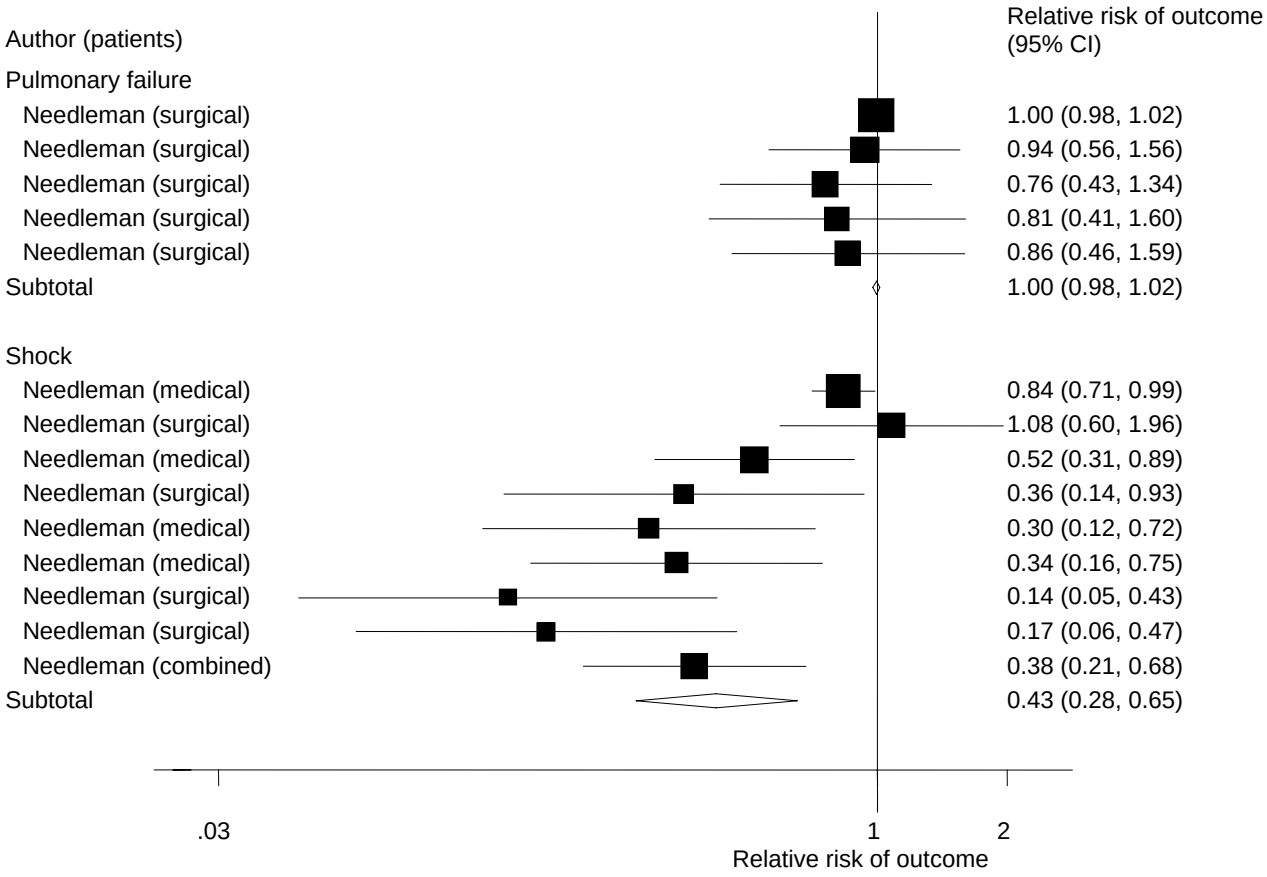


Figure 24. Relative risk of treatment complications corresponding to an increase by 1% in the proportion of RNs (results from individual studies and pooled estimates)

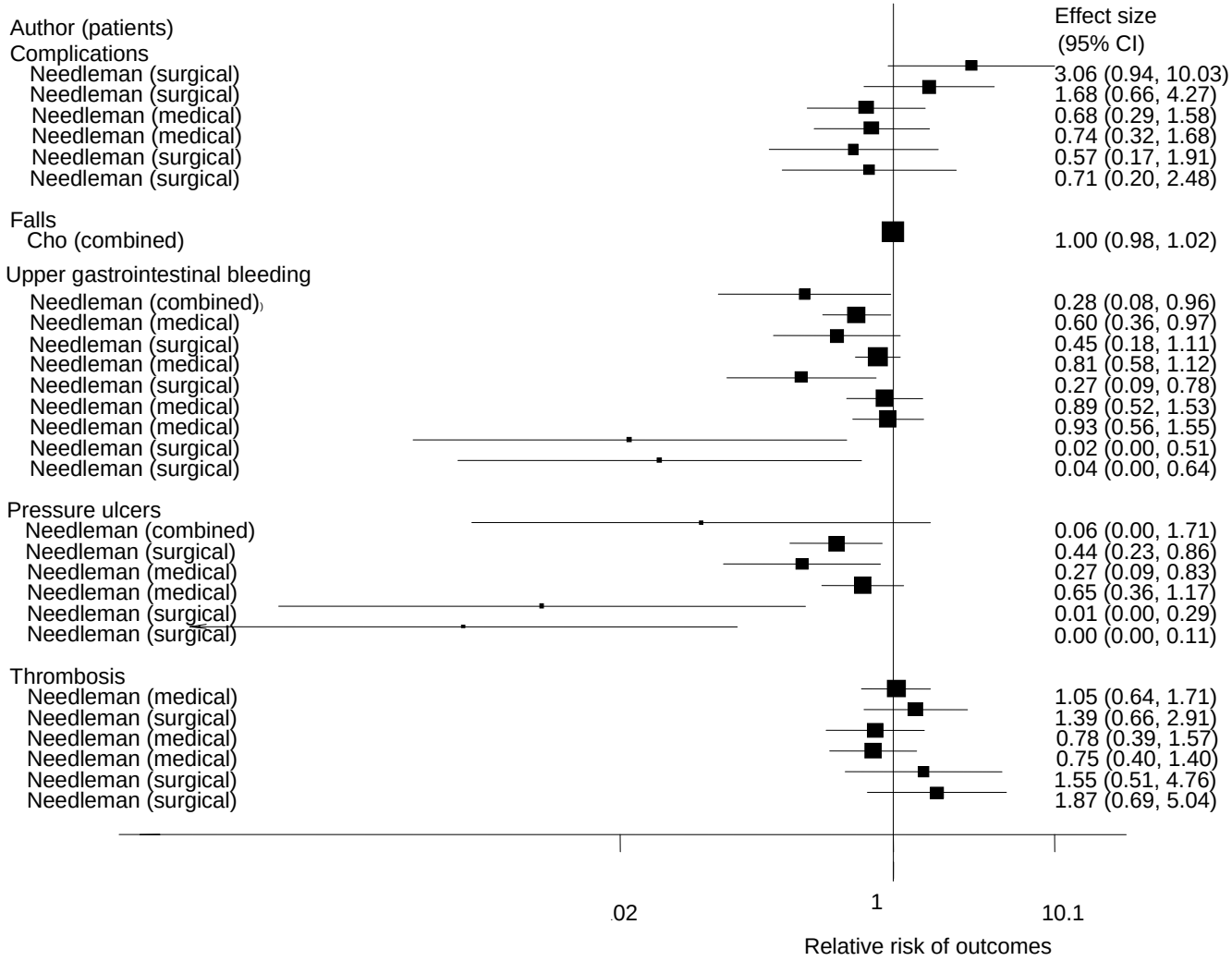


Table 20. Relative risk of patient outcomes corresponding to an increase by 1% in licensed nurse hours

Outcomes	Relative Risk	95% CI
Author (patients)		
Failure to rescue		
Needleman[27] (medical)	0.81	0.66; 1.00
Needleman[27] (surgical)	0.73	0.49; 1.09
Needleman[27] (medical)	0.90	0.80; 1.01
Needleman[27] (surgical)	0.82	0.70; 0.96
Needleman[27] (medical)	0.58	0.40; 0.86
Needleman[27] (medical)	0.69	0.50; 0.95
Needleman[27] (surgical)	0.45	0.22; 0.92
Needleman[27] (surgical)	0.54	0.30; 0.99
Needleman[27] (medical)	0.80	0.64; 0.97
Needleman[27] (surgical)	0.81	0.68; 0.94
Needleman[27] (surgical)	0.70	0.37; 1.03
Needleman[27] (surgical)	0.72	0.42; 1.01
Needleman[7] (medical)	0.90	0.80; 1.00
Needleman[27] (medical)	0.81	0.64; 0.99
Needleman[27] (medical)	0.81	0.66; 1.00
Cheung[63] (medical)	1.00	1.00; 1.00
Mortality		
Berney[30] (surgical)	0.97	0.95; 0.98
Needleman[27] (medical)	0.90	0.74; 1.09
Needleman[27] (surgical)	0.99	0.67; 1.47
Needleman[27] (medical)	0.98	0.90; 1.08
Needleman[27] (surgical)	0.88	0.75; 1.03
Needleman[27] (medical)	0.91	0.65; 1.27
Needleman[27] (medical)	0.89	0.68; 1.16
Needleman[27] (surgical)	0.76	0.34; 1.69
Needleman[27] (surgical)	0.87	0.47; 1.61
Needleman[27] (medical)	0.90	0.74; 1.09
CPR		
Needleman[27] (surgical)	0.59	0.42; 0.76
Needleman[27] (surgical)	0.42	0.10; 0.74
Needleman[27] (surgical)	0.60	0.19; 1.00
Needleman[27] (medical)	0.66	0.48; 0.85
Needleman[27] (medical)	0.40	0.18; 0.63
Pulmonary failure		
Needleman[27] (surgical)	1.10	0.63; 1.92
Needleman[27] (surgical)	1.21	0.99; 1.47
Needleman[27] (surgical)	1.00	0.39; 2.60
Needleman[27] (surgical)	1.02	0.45; 2.32
Shock		
Needleman[27] (medical)	0.46	0.27; 0.81
Needleman[27] (surgical)	0.54	0.28; 1.04
Needleman[27] (medical)	0.66	0.50; 0.87
Needleman[27] (surgical)	0.59	0.44; 0.78
Needleman[27] (medical)	0.20	0.08; 0.53
Needleman[27] (medical)	0.40	0.19; 0.86
Needleman[27] (surgical)	0.22	0.09; 0.57
Needleman[27] (surgical)	0.27	0.12; 0.61
Needleman[27] (medical)	0.49	0.21; 0.77
Needleman[27] (surgical)	0.59	0.42; 0.76
Needleman[27] (surgical)	0.42	0.10; 0.74
Needleman[27] (surgical)	0.60	0.19; 1.00
Needleman[27] (medical)	0.66	0.48; 0.85
Needleman[27] (medical)	0.40	0.18; 0.63
Needleman[27] (medical)	0.46	0.27; 0.81

Table 20. Relative risk of patient outcomes corresponding to an increase by 1% in licensed nurse hours (continued)

Outcomes	Relative Risk	95% CI
Nosocomial Infection		
Cheung[63] (medical)	1.00	1.00; 1.00
Pneumonia		
Needleman[27] (medical)	0.60	0.44; 0.80
Needleman[27] (surgical)	0.56	0.31; 1.01
Needleman[27] (medical)	0.83	0.71; 0.98
Needleman[27] (surgical)	0.94	0.76; 1.16
Needleman[27] (medical)	0.52	0.32; 0.87
Needleman[27] (medical)	0.69	0.47; 1.03
Needleman[27] (surgical)	0.66	0.26; 1.69
Needleman[27] (surgical)	0.79	0.37; 1.71
Needleman[27] (medical)	0.61	0.42; 0.79
Needleman[27] (surgical)	0.94	0.74; 1.13
Needleman[27] (surgical)	0.36	0.12; 0.59
Needleman[27] (surgical)	0.52	0.20; 0.84
Needleman[27] (medical)	0.83	0.70; 0.96
Needleman[27] (medical)	0.59	0.39; 0.78
Needleman[27] (medical)	0.59	0.44; 0.80
Surgical wound infection		
Needleman[27] (surgical)	1.91	1.34; 2.48
Needleman[27] (surgical)	0.93	0.24; 1.62
Needleman[27] (surgical)	1.33	0.53; 2.13
Sepsis		
Needleman[27] (medical)	1.39	0.85; 1.94
Needleman[27] (surgical)	1.10	0.85; 1.35
Needleman[27] (surgical)	0.86	0.30; 1.42
Needleman[27] (surgical)	1.11	0.47; 1.74
Needleman[27] (medical)	1.24	0.97; 1.51
Needleman[27] (medical)	1.11	0.65; 1.56
Needleman[27] (medical)	1.01	1.00; 1.01
Berney[30] (surgical)	1.01	1.00; 1.01
Urinary tract infection		
Needleman[27] (medical)	0.48	0.38; 0.61
Needleman[27] (surgical)	0.67	0.46; 0.98
Needleman[27] (medical)	0.77	0.68; 0.86
Needleman[27] (surgical)	0.89	0.75; 1.07
Needleman[27] (medical)	0.44	0.28; 0.70
Needleman[27] (medical)	0.60	0.41; 0.87
Needleman[27] (surgical)	0.64	0.30; 1.37
Needleman[27] (medical)	0.49	0.37 0.61
Needleman[27] (surgical)	0.88	0.71; 1.04
Needleman[27] (surgical)	0.68	0.40; 0.95
Needleman[27] (surgical)	0.59	0.36; 0.82
Needleman[27] (medical)	0.76	0.67; 0.85
Needleman[27] (medical)	0.54	0.41; 0.66
Needleman[27] (medical)	0.48	0.38; 0.61
Berney[30] (medical)	1.00	0.99; 1.00
Berney[30] (surgical)	1.00	0.99; 1.00
Complications		
Needleman[27] (surgical)	2.43	1.00; 5.93
Needleman[27] (medical)	1.86	1.32; 2.62
Needleman[27] (surgical)	1.62	1.02; 2.56
Needleman[27] (medical)	1.44	0.39; 5.32
Needleman[27] (medical)	1.04	0.32; 3.35
Needleman[27] (surgical)	4.13	0.53; 32.25
Needleman[27] (surgical)	1.83	0.32; 10.49

Table 20. Relative risk of patient outcomes corresponding to an increase by 1% in licensed nurse hours (continued)

Outcomes	Relative Risk	95% CI
Gastrointestinal bleeding		
Needleman[27] (medical)	0.66	0.46; 0.96
Needleman[27] (surgical)	0.57	0.28; 1.15
Needleman[27] (medical)	0.96	0.79; 1.16
Needleman[27] (surgical)	0.78	0.59; 1.03
Needleman[27] (medical)	0.83	0.40; 1.72
Needleman[27] (medical)	0.87	0.48; 1.58
Needleman[27] (surgical)	0.72	0.22; 2.37
Needleman[27] (surgical)	0.63	0.23; 1.71
Needleman[27] (surgical)	0.77	0.56; 0.98
Needleman[27] (surgical)	0.40	0.07; 0.74
Needleman[27] (surgical)	0.53	0.15; 0.90
Needleman[27] (medical)	0.96	0.77; 1.15
Needleman[27] (medical)	0.68	0.42; 0.95
Needleman[27] (medical)	0.66	0.45; 0.96
Berney[30] (medical)	1.00	1.00; 1.01
Berney[30] (surgical)	1.01	1.00; 1.01
Pressure ulcers		
Cheung[63] (medical)	1.00	1.00; 1.00
Needleman[27] (medical)	0.73	0.49; 1.08
Needleman[27] (surgical)	1.38	0.69; 2.78
Needleman[27] (surgical)	0.94	0.74; 1.19
Needleman[27] (medical)	0.35	0.15; 0.79
Needleman[27] (medical)	0.55	0.28; 1.06
Needleman[27] (surgical)	0.68	0.18; 2.52
Needleman[27] (surgical)	0.71	0.26; 1.94
Needleman[27] (medical)	0.77	0.46; 1.07
Needleman[27] (surgical)	0.90	0.68; 1.12
Needleman[27] (surgical)	0.81	0.14; 1.49
Needleman[27] (surgical)	0.83	0.24; 1.41
Needleman[27] (medical)	0.89	0.70; 1.09
Needleman[27] (medical)	0.71	0.40; 1.02
Thrombosis		
Needleman[277] (medical)	1.39	0.92; 2.11
Needleman[27] (surgical)	1.29	0.66; 2.54
Needleman[27] (medical)	1.28	1.02; 1.60
Needleman[27] (surgical)	1.52	1.12; 2.07
Needleman[27] (medical)	1.97	0.84; 4.58
Needleman[27] (Medical)	1.55	0.78; 3.07
Needleman[27] (surgical)	0.03	0.00; 0.66
Needleman[27] (surgical)	1.11	1.04; 1.18

Figure 25. Relative risk of hospital related mortality and failure to rescue corresponding to an increase by 1% in the proportion of licensed nurses

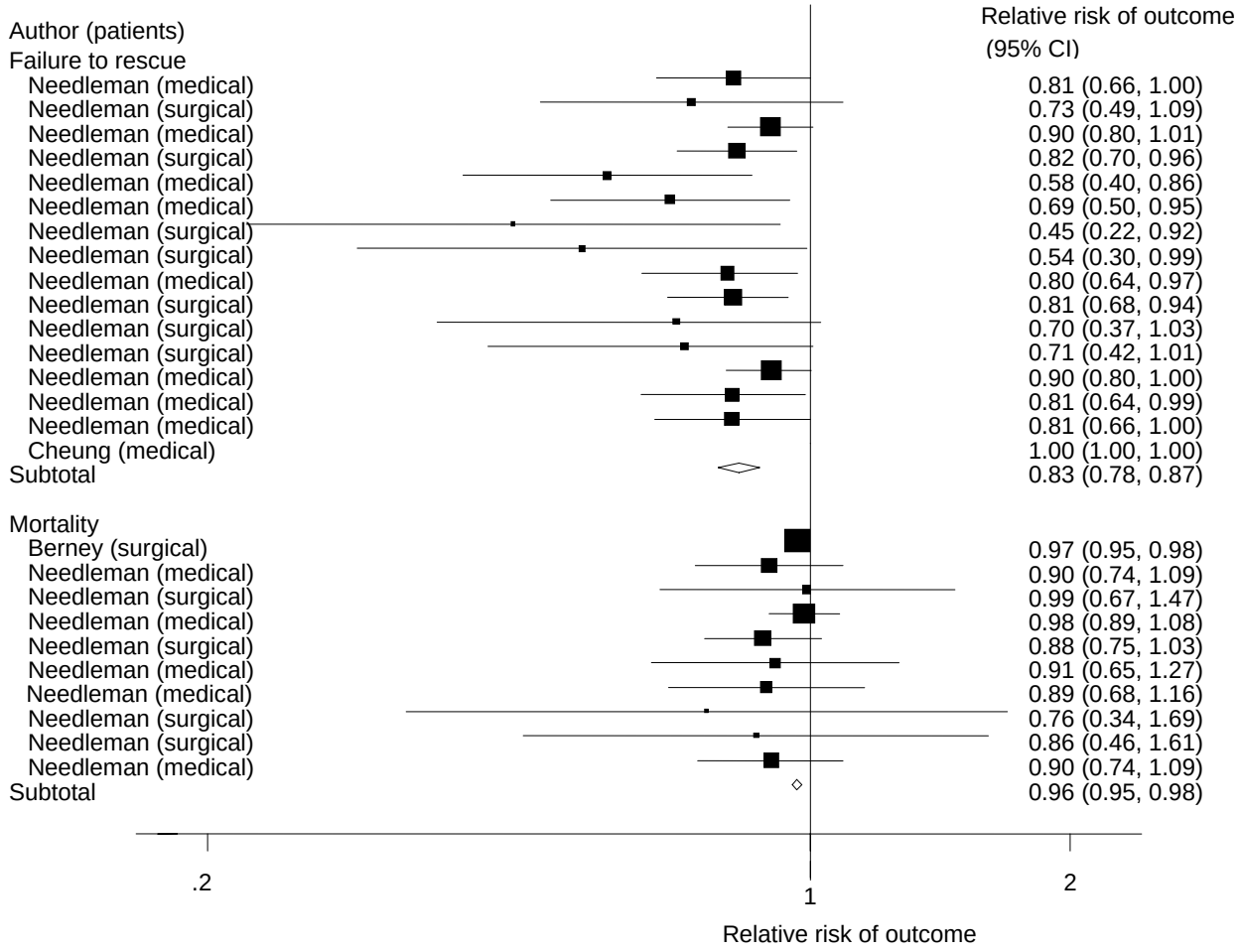
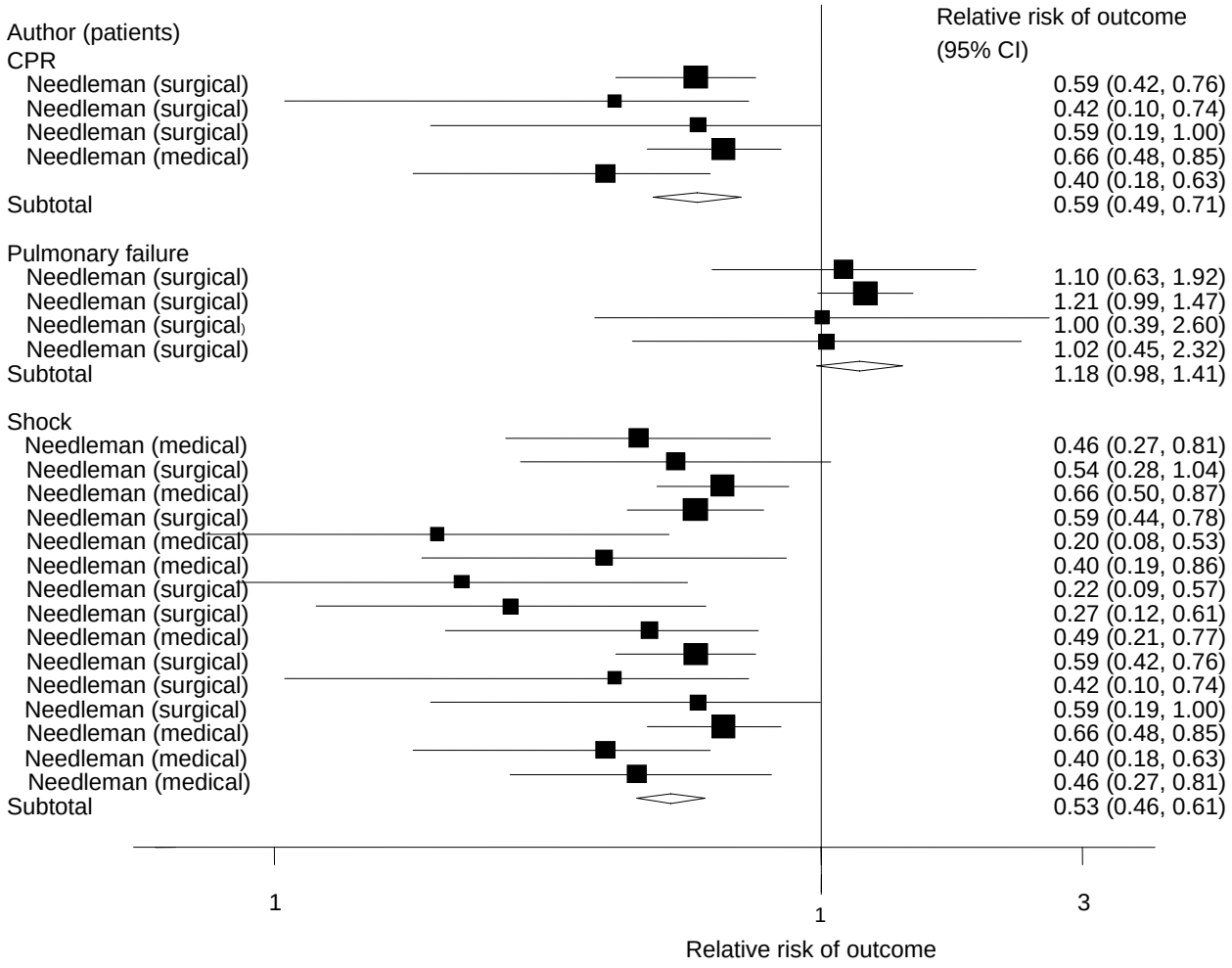


Figure 26. Relative risk of patient outcomes corresponding to an increase by 1% in the proportion of licensed nurses



Chapter 4. Discussion

Association or Cause

The present review and meta-analysis confirm previous contentions that increased nurse staffing in hospitals is associated with better care outcomes.[27,51,93] A persistent question is whether this association reflects a causal relationship. One test of such a causal relationship should be that higher staffing levels should produce stronger effects for nurse sensitive outcomes than for more general outcomes. The evidence across 14 studies consistently suggests that the risk of hospital related mortality was 9 percent lower in ICUs, 6 percent lower for medical patients, and 16 percent lower for surgical patients for each additional RN FTE per patient day (Figure 27). The risk of nurse-sensitive patient outcomes was comparable with those for mortality independent of study design. The relative risk of failure to rescue was reduced by 16 percent in surgical patients and hospital-acquired pneumonia by 30 percent in ICUs, rates substantially higher than those for mortality.

Another test would be the difference in effect size between longitudinal and cross-sectional designs. The former should more directly reflect the effects of changing staffing patterns by holding more constant other hospital variables. Studies that attempted to assess temporality in the association between nurse staffing and failure to rescue had a lower relative risk per RN FTE per patient day ratio (RR 0.84, 95 percent CI 0.75-0.93) than did those using cross-sectional designs (RR 0.92, 95 percent CI 0.91-0.93), supporting the presence of an association rather than a cause.

We also examined the role of the study characteristics on the association between nurse ratios and patient outcomes. We tested the following study characteristics that could modify the association between nurse ratios and patient outcomes: quality scores, assessment of temporality in the association, analytic units, hospital units, patient populations, the adjustment for patient comorbidities, provider characteristic, and clustering of patients and hospitals. The authors adjusted for patient comorbidities at patient and hospital levels and for provider characteristics including hospital teaching and profit status, size and volume, technology index, HMO penetration, and staffing. We examined the association of four aspects of nurse ratios (total, RN, LPN/LVN, UAP) licensed and the same four for nursing hours with 16 outcomes expressed as rates and 19 expressed as relative risks for a total of 280 (eight effect modifiers times 35 outcomes). Only a small proportion of tested models showed a significant influence of study design on the association with nurse staffing and patient outcomes (Appendix G*,Table G30). Among the possible interactions, only the LPN effects were significant more the 30 percent of the time. The proportion of significant interactions was considerably lower for relative risks.

Hospitals that invest in more nurses may also invest in other actions that improve quality. Empirical evidence suggests that magnet hospitals provide high quality care and report better patient outcomes in relation to nurse staffing.[10,52,57,198,199]

Several lines of evidence suggest that overall hospital commitment to a high quality of care in combination with effective nurse retention strategies leads to better patient outcomes, patient satisfaction with overall and nursing care, and nurse satisfaction with job and provided care.[10,52-54,57-59] Hospital volume,[20] physician practice patterns, and collaboration with nurses[8,9] may affect

* Appendixes and Evidence Tables for this report are provided electronically at http://www.ahrq.gov/clinic/tp/nursesttp.htm

patient outcomes. Professional practice environments in hospitals, which enable nurses to control their practice through governance also contribute to nurses' job satisfaction and positive perceptions of nurse autonomy. These factors are associated with nurse retention and better patient outcomes in several reports.[15,21,78,152,161,164,165,200,201] Hospitals with better professional nurse practice environment had improved RN staffing ratios.[55,56] Magnet hospitals had lower patients per RN ratios, better nurse manager ability and support, and collegial nurse-physician relations.[53-57,152,202,203] The quality of the nurse professional practice work environment correlated with patient safety outcomes in several studies.[15,21,66,164,201,204]

The outcomes of hospital care are the result of many factors. The studies reviewed here did not, and perhaps could not, address many salient issues. Patient outcomes are affected by patient characteristics. Case mix, when addressed, was usually handled as a mean number averaged across all patients in a unit or hospital. Such averages can hide a lot of different mixtures. Detailed information on comorbidities and disease severity was not included. Likewise, the nature of core medical treatments was not addressed. The absence of these measures can have varied effects depending on whether one believes they represent noise or bias. Case mix differences may hide areas where nurse staffing makes a bigger difference if it is not associated directly with staffing levels, but if it is, it could lead to bias. Such bias should result from more staff going to patients who need more care and hence would decrease the effects seen. These studies best approximate that correction by examining different types of units, which serve patients in varying levels of severity.

The absence of information on medical care is another important shortcoming of these studies, although it would greatly complicate the study designs. Here too, bias needs to be separated from noise. There is no strong basis to assume that the quality of medical care is necessarily correlated with the level of staffing, but it seems unlikely that it would be inversely correlated. With that assumption, any bias would result from hospitals that invested in more staffing also pressing for better medical care, an assumption that seems feasible.

Marginal Effects

Previous systematic reviews did not estimate the effect size of different nurse staffing measures.[92,93] Associations were considered to be clinically important when a 10 percent difference in staffing levels was associated with significant changes in outcomes.[92] When attempting to find optimal nurse staffing ratio and hours, the effect size could not be estimated reliably because of differences in the studies and possible curvilinear associations.[93] One study[26] examined the overall linear trend in adverse events corresponding to a one unit increase in nurse staffing and differences in the rates of patient outcomes among the lowest and highest quartiles of the nurse staffing distribution to find an optimal staffing pattern.[26]

Hospital mortality shows a decline with increasing staffing, but the decline is not linear. The risk increases quickly as the patients per RN per shift ratio rises above four to five. The mean increase of 7 percent for each additional patient per RN per shift can be misleading; the goodness of fit of the linear slope varied across the distribution of nurse to patient ratio. The effect size of this nonlinear association was tested to detect the overall trend and relative and absolute changes in patient outcomes among nurse staffing categories using quartiles of the distribution. Comparing the lowest with the highest quartiles of patients per RN per shift ratio, the observed risk of mortality was 61 percent compared to expected 85 percent (1.61 observed vs. 1.85 expected) if the slope was applied to the differences in the ratio. Moreover, we would expect the

risk of mortality to be 19 percent lower when the workload of patients per RN per shift decreased from four to two patients, but in fact it was only 6 percent lower.

We used several ways to analyze strengths and limitations of the individual studies. Applicability of the study was estimated according to a sampling of eligible hospitals and patients with the highest applicability in studies with random population based sampling and random hospital-based sampling and the lowest in the studies with convenient and self-selected sampling. We analyzed the internal validity of the studies by the validation of measured nurse staffing, patient outcomes, and all confounding factors the authors reported. We graded the adjustment for patient characteristics (age, race, comorbidities, socioeconomic status), provider characteristics, and clustering of patients and clinics. We included summarized quality scores and the fact of adjustment for the each of confiding factors in the meta-regression and sensitivity analysis. We compared the direction and the strength of the association from the studies that used different definitions of nurse staffing and patient outcomes (rates and relative risk). We compared the direction and the strength of the association from the studies at patient level analysis that could carefully adjust for patient and nurses characteristics (better internal validity but lower applicability) and large multi-centers studies obtained hospital averages from administrative databases (low internal validity but better applicability). To examine statistically the influence of study quality on tested associations we compared pooled estimates weighted by the sample size and weighted by the quality of the studies and did not detect substantial differences.

Geographical variations in nurse distributions[144] and rates of fatal adverse events[148] may impact the effect size of nurse staffing on patient outcomes. Few multi-hospital studies used random effects models to incorporate geographical differences in the estimation;[33,49,94] 37 percent of the included studies reported random sampling and assessments of sampling bias. We compared means of nurse staffing in the studies we included in the meta-analysis with published means[26] and did not detect substantial differences. However, the report of the Institute of Medicine[74] suggested that a larger proportion of hospitals have poorer nurse staffing than published in scientific research. Therefore, the effect size of nurse staffing on patient outcomes from the present report can be generalized only to hospitals with similar nurse staffing patterns.

Nurse Staffing and Patient Outcomes in Hospitals

The majority of the studies found that hospitals with more RNs working with patients had a lower level of patient adverse events related to health care. If these associations were causal, Table 21 estimates the effect size in terms of the number of patient adverse events that could be avoided by adding 8 RN hours a patient receives during 24 hours in a hospital. Table 22 shows the proportion of patient adverse events that could theoretically be avoided by reducing the number of patients assigned to an RN during an 8-hour shift.

Staffing Measures

Two general measures of nurse staffing were studied. One looks superficially at hours of care provided by different types of nursing staff averaging FTEs of different nurse categories at the hospital level,[11,18,19] including only productive hours worked in direct care.[28,61,62] The other relies on a less precise ratio of total nurse staffing to patient volume derived from administrative databases[63-65] averaging annual nurse-to patient ratios[20] at the hospital or unit level. The patients

per RN per shift ratio was more frequently used and provided greater evidence of the effect, but both showed generally the same trends. Inconsistency in nurse staffing operational definitions and methods to measure with an unknown "gold standard" to assess staffing patterns at the patient levels may bias the results of the studies and consequently, pooled analysis.[206] Because many of the studies of nurse staffing were based on administrative data, they expressed staffing levels in terms of RN FTEs per patient or similar measures. However, the individuals charged with actually managing staffing are more likely to think in terms of patients per nurse. A simple, back-of-the-envelope transformation would be that 1 RN FTE per patient day would translate to 8 RN hours per patient day or three patients per RN per shift. If the average is 7.8 RN hours per patient day (~3 patients per RN per shift), then increasing staffing by 1 RN FTE per patient day would mean a decrease to 1.5 patients per nurse.

The effect size varied depending on the nurse staffing measure. The reduction in relative risk of hospital related mortality is 16 percent for 1 RN FTE per patient day and 1 percent for an additional RN hour per patient day in surgical patients. Assuming that every additional RN per FTE patient day would provide approximately 8 additional RN hours per patient day, the expected reduction should be more than observed in the studies that examined the risk of mortality in relation to nurse hours (Table 23). The comparison of the effect size on patient outcomes among quartiles of the RN FTE per patient day ratio and nurse hours per patient day detected the same pattern (Table 24); the maximal reduction in relative risk of hospital-related mortality and adverse events occurred when no more than two patients were assigned to an RN in ICUs and in surgical units, and more than 11 nurse hours were spent per one patient day in ICUs and more than 7-8 hours in surgical and medical patients. We did not find consistent evidence that a further increase in RN FTE per patient day ratio can provide better patient safety. Confirming the previous observations,[29,93,139] we detected a curvilinear association between the RN FTE per patient day ratio and hospital related mortality, nosocomial and bloodstream infections, and hospital acquired pneumonia with the optimal association at 2-2.5 patients per RN per shift in ICUs and surgical patients.

The association between patient outcomes and different definitions of nurse staffing suggest several reasons why nurse hours do not always provide a valid estimation of nurse-to-patient ratios. Nurse hours per patient day reflect average staffing across a 24-hour period and do not reflect fluctuations in patient census, scheduling patterns during different shifts,[9,13] and periods of the year.[66,67] They do not account for the time nurses spend in meetings, educational activities, and administrative work. Therefore, "productive hours per patient day" may underestimate nurse staffing levels when a large proportion of worked hours was not spent on direct patient care.[60,109] These reasons may help to explain why the effect size varied across nurse staffing measures.

The majority of studies reviewed in this report focused on registered nurses working in acute care hospital settings. Evidence on the association between LPN/LVN and UAP personnel is limited and controversial. The authors designed the studies to evaluate the effect of nurse staffing on patient outcomes sensitive to RN rather LPN/LVN and UAP work. Skill mix may not directly reflect the hospital's commitment to quality of care and financial strategies. Future research should address the role of skill mix and the contributions of LPNs/LVNs, and UAPs on quality of care.

Care Setting

Nurse staffing had a different effect in different care settings. The addition of one unit of nursing care may vary depending on the baseline rate. For example, ICUs have higher staffing levels than typical hospital units. The effect of an additional nurse hour might be quite dissimilar in that context. We evaluated differences in the association between nurse staffing variables and patient outcomes by the type of hospital units (ICU, surgical, medical, neonatal) and by the type of patients (medical vs. surgical).[27] We found a greater reduction in the relative risk of hospital-related mortality (16 percent) in surgical patients for an additional one RN FTE per patient day compared to a reduction of 6 percent in medical patients. Given a higher baseline mortality in surgical patients, the reduction in nurse workload would save six surgical compared to five medical patients per 1,000 hospitalized. Consistent with previous studies,[26,27] the present meta-analysis found consistent evidence that surgical patients would demonstrate a greater cost-benefit from improved nurse staffing. Increasing the care of surgical patients by one RN FTE per patient day would eliminate 16 percent of failure to rescue (26 saved lives per 1,000 hospitalized) compared with 9.2 percent in all patients (medical and surgical). Such consistent and large improvements in patient safety from increasing the RN FTE per patient day ratio in surgical patients and in ICUs suggest heath care administrators can improve quality of care in these categories of patients using optimal staffing ratios.[207]

Other Factors

The primary independent variable examined here is the volume of nursing, tempered by some attention to the education level. But other factors may also be relevant. Numbers alone do not likely explain all that happens. A nurse is not necessarily a nurse.[206] Skill, organization, and leadership undoubtedly play a role but are much more difficult to assess. Usually we work in just the opposite direction inferring skill from outcomes after other factors have been accounted for. Because these studies rarely include data on case mix and other factors that help to explain outcomes, they cannot be used to infer differences in skill levels. Included studies did not provide the information on the quality of medical and surgical treatment. The importance of nurses' professional competence and performance have been discussed with regard to developing standards of nurse performance to encourage high quality of care.[70-73]

There are also questions about the association between nurse experience and patient outcomes. The independent effects of individual nurse competence in interaction with nurse staffing are not well understood and were not the subject of the present review. However, implementing the results of the present review to improve the quality of hospital care, we need to remember that complex interventions in combination with nurse staffing strategies provided better patient benefits. [208-212] Implementing evidence-based clinical pathways that involve nurse and physician education and collaboration may increase the effectiveness of nursing work and improve patient outcomes.[213,214] Several randomized clinical trials reported a significant improvement in nurse performance and patient outcomes as a result of quality improvement initiatives.[215-224]

The majority of studies focused on adverse patient events and mortality. However, the estimation of quality of care may include patient satisfaction with nursing and overall medical care and improved quality of life. Future research should address patient positive outcomes,

compliance with prescribed treatments, patient functional status, and education in association with provided care including nurse staffing.

Policy Implications

The case for causation has yet to be made. Nevertheless, if one accepts the results presented as suggesting a causal relationship between nurse staffing and outcomes, the next question is one of practicality. Possible staffing decisions to improve quality of care would involve comparing existing staffing with changes in staffing needed to achieve desirable patient outcomes. The effect sizes depend on rich staffing ratios, which are not feasible in most hospitals. Moreover, defining the best level of nurse staffing requires addressing cost-effectiveness analysis[225] that was beyond the present report. Because hospitals are paid a fixed rate under diagnosis related groups (DRGs) that does not reflect the quality of care they provide, they are not in a position to assume substantial cost burdens. The estimation of the threshold in terms of marginal costs and benefits depends on value placed on survival, patient satisfaction, and quality of life (QOL).[6]

Policymakers can consider several approaches to regulate nurse staffing. Our calculations suggest that it is difficult to set fixed nursing standards. Indeed, fixed minimum nurse-to patient ratios implemented in several states did not provide the expected patient safety benefits.[226] To maintain a reasonable staffing level, the increasing nurse shortage may force hospitals to reduce capacity rather than increase staffing. Mandatory nurse to patient ratios without legislative agreement to increase reimbursement may result in administrative decisions to reduce support staff positions and investments to other quality initiatives.[225] Patient acuity-based staffing requirements adjust staffing for patient diagnosis and comorbidities but do not regulate shift-to shift fluctuations in nurse staffing that have an important influence on quality of care. [175,205] Moreover, no consensus exists about patient classification systems, which are different among hospitals and states.[113,227-230] Public disclosure of nurse staffing was introduced in one state,[227] but its effect on quality of care is not known.[226] Pay-for performance has been proposed to provide incentives for quality of care, but its effect on cost effectiveness is not well understood.[226] Ideally we should monitor every hospital in the United States to see how differences in policies and financial performance affect the cost effectiveness of staffing and its effect on quality of health care.[225,226]

Finally, the number of patients a nurse cares for is not a true measure of the “work” of the nurse. The patient flow (admissions, discharges, return from surgeries, transfers to other units, transfers from other units) can result in nurses providing care for many more patients in a day than what is reflected in the RN hour per patient day or nurse to patient ratio. This significant factor was not addressed in any of the studies reviewed and should be considered as a nurse staffing measure for future studies. Another factor not considered in the studies is the number and type of support personnel available to nurses to assist them with care of patients. A recent trend in hospitals is having Rapid Response Teams (RRTs). This team is usually comprised of an experienced critical care nurse, respiratory therapist, and a physician. The team can be called by any nurse in the hospital if the nurse assesses that the patient’s condition is changing such that it could potentially result in a negative outcome. Nurses also have access to consultation from advanced practice nurses, unit-based nurse educators, charge nurses, assistant nurse managers, and nurse managers. These types of nursing hours are not included in the studies or considered as nurse staffing measures.

In conclusion, the present review found consistent statistically and clinically significant associations between nurse staffing and adjusted relative risk of hospital related mortality, failure to rescue, and other patient outcomes sensitive to nursing care, but we cannot conclude these relationships are causal. Hence, they cannot be interpreted as a basis for recommending specific staffing levels. The effect size is greater in surgical patients and in ICUs. The associations may include other structure and process factors in causal pathway to patient effective and safe care. A commitment to a high quality care at hospital level may provide better patient outcomes in relation to nurse staffing.

Strength of the Evidence

Taken as a whole, there is consistent evidence of an association between the level of nurse staffing and patient outcomes but no clear case for causation. The nature of the study designs precludes any efforts to establish a causal relationship. There are no interventions, let alone controlled trials. The effect on quality of other salient input, such as medical care, is not tested. Adjustments for case mix rely on averages across units or hospitals. The quality of the studies is modest by standard measures, and the coverage of salient variables that could affect quality is weak. The distinction is still far from clear. The association was somewhat stronger with nurse-sensitive outcomes than with more generic ones like mortality, but it was also stronger with cross-sectional rather than longitudinal designs.

Recommendations for Future Research

While it is not feasible to think about research designs that might be more interventional, it may be possible to take advantage of natural experiments where nurse staffing levels are changed holding other factors constant. Future observational studies will need to take cognizance of the many other factors that can affect the outcomes of interest, especially medical care, patient characteristics, and the organization of nursing units and staffs. Larger multi-center studies will be needed. Nonetheless, it is unlikely that all the salient variables can be addressed in any one study. Future work will need to target specific questions and collect and analyze enough information to isolate the effects of nurse staffing levels.

Figure 27. Relative risk of outcomes corresponding to an increase by RN FTE/patient day consistent across the studies

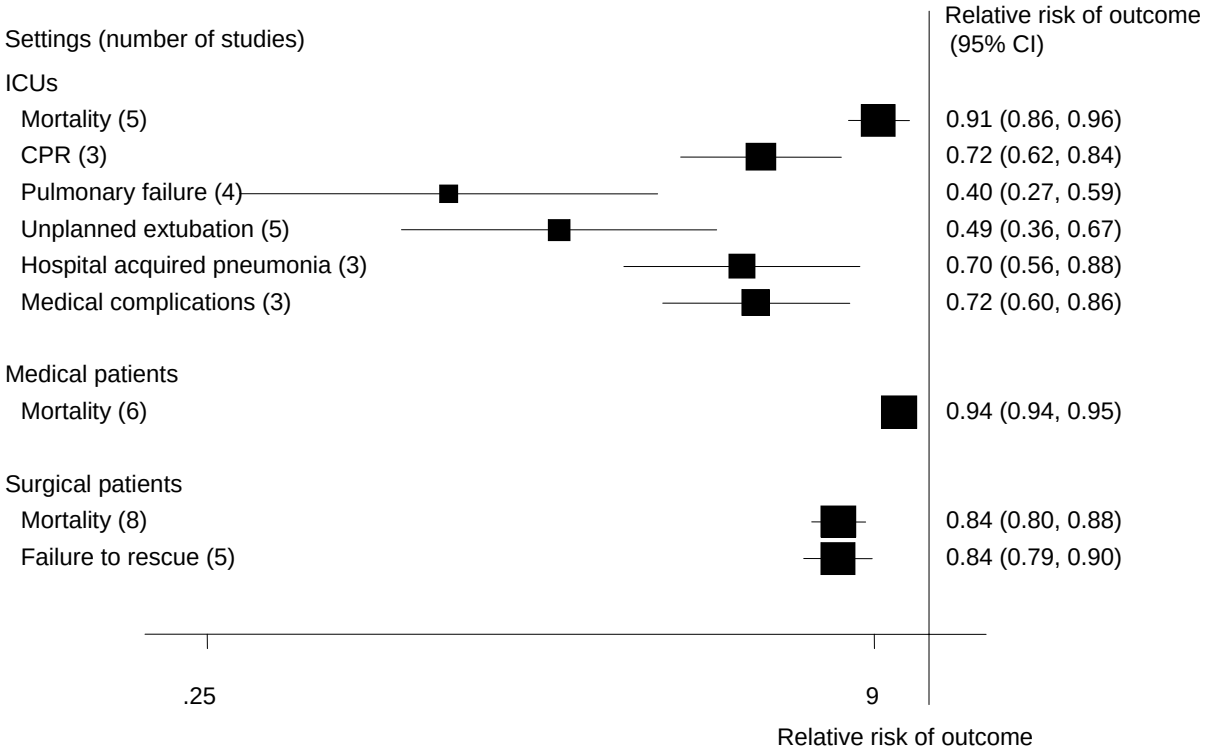


Table 21. The number of patient adverse events that could be avoided by additional 8 RN hours a patient receives during 24 hours in a hospital

Patients' Condition Related to Health Care, Not to a Primary Diagnosis	Number of Avoided Events/1,000 Hospitalized Patients (95% CI)
All patients	
Mortality, overall	9 (6-12)
Mortality, hospital level analysis	3 (2-4)
Mortality, medical patients	5 (4-5)
Hospital acquired pneumonia	5 (1-8)
Failure to rescue	24 (14-34)
CPR	2 (1-2)
ICUs	
Mortality	5 (2-8)
Hospital acquired pneumonia	7 (3-10)
Pulmonary failure	7 (5-9)
Unplanned extubation	6 (4-8)
CPR	2 (1-2)
Nosocomial Infection	10 (6-13)
Surgical patients	
Mortality	6 (4-8)
Failure to rescue	26 (17-35)
Surgical wound infection	7 (1-8)
CPR	1 (1-2)

Table 22. The proportion of patient adverse events (%) that could be avoided by reducing the number of patients assigned to an RN during an 8-hour shift

Patients' Conditions Related to Health Care, Not to a Primary Diagnosis	Number of Patients Assigned to 1 RN During a Shift	Percentage of Patient Adverse Events that Could be Avoided by Reducing the Number of Patients per RN (95% CI)
ICUs		
Mortality	<3 vs. 3-4	5.6 (3.4; 7.7)
Sepsis	<1.6 vs. 3.3	42.7 (8.8; 64.0)
Sepsis	1 vs. 3.3	42.2 (6.0; 64.4)
CPR	<1.6 vs. 3.3	34.4 (26.7; 41.4)
CPR	1 vs. 3.3	46.3 (39.2; 52.6)
CPR	1 vs. >4	25.4 (16.7; 33.2)
Medical complications	<1.6 vs. 3.3	40.8 (28.6; 50.9)
Medical complications	1 vs. 3.3	46.1 (33.6; 56.3)
Medical complications	1 vs. >4	25.4 (10.1; 38.1)
Pulmonary failure	<1.6 vs. 3.3	60.0 (30.9; 76.9)
Pulmonary failure	<1.6 vs. 3	63.7 (31.3; 80.8)
Pulmonary failure	1 vs. >4	57.1 (13.8; 78.6)
Unplanned extubation	<1.6 vs. 3.3	44.8 (22.2; 60.9)
Unplanned extubation	<1.6 vs. 3	68.0 (49.2; 79.8)
Unplanned extubation	1 vs. 3	56.9 (38.2; 69.9)
Unplanned extubation	3.3 vs. >4	42.0 (20.2; 57.9)
Surgical patients		
Mortality	≤2 vs. 4-6	24.3 (17.9; 30.3)
Mortality	≤2 vs. >6	38.4 (34.1; 42.4)
Mortality	2-3.5 vs. 4-6	19.8 (13.3;25.9)
Mortality	2-3.5 vs. >6	34.7 (30.4; 38.7)
Mortality	4-6 vs. >6	18.6 (11.8; 24.8)
Hospital acquired pneumonia	4 vs. >5	24.6 (5.2; 40.0)
Nosocomial infection	<2 vs. 3	93.6 (65.7; 98.8)
Surgical wound infection	4 vs. >5	20.4 (6.5; 32.3)
Sepsis	<2 vs. 3	44.4 (16.4; 63.0)
Sepsis	<2 vs. >5	49.4 (8.8; 71.9)
Sepsis	4 vs. >5	28.5 (6.6; 45.3)
CPR	<2 vs. 3	30.8 (13.1; 44.9)
CPR	<2 vs. 4	25.4 (5.0; 41.4)
Failure to rescue	<2 vs. 4	25.5 (17.1; 33.0)
Failure to rescue	<2 vs. >5	39.1 (33.6; 44.2)
Failure to rescue	3 vs. 4	20.6 (12.2; 28.3)
Failure to rescue	3 vs. >5	35.2 (29.7; 40.2)
Failure to rescue	4 vs. >5	18.3 (9.1; 26.6)
Pulmonary failure	<2 vs. 3	61.9 (28.2; 79.7)
Pulmonary failure	<2 vs. 4	75.1 (45.4; 88.6)
Unplanned extubation	<2 vs. 3	44.3 (18.4; 62.0)
Unplanned extubation	<2 vs. 4	71.5 (53.8; 82.4)
Unplanned extubation	3 vs. 4	48.7 (30.6; 62.1)

Table 23. Relative risk of mortality and nurse sensitive patient outcomes corresponding to one unit increase in nurse staffing ratios and hours (pooled estimates)

Outcome	N	Increment	RR	95% CI	N	Increment	RR	95% CI
Mortality	14	1 RN FTE/patient day	0.92	0.90; 0.94	1	1 nurse hour/patient day		
	4	1 patient/LPN/shift	0.99	0.99; 1	7*	1 RN hour/patient day	1.00	0.90; 1.12
	1	1 patient/UAP/shift	0.99	0.99; 1.07	3	1 LPN hour/patient day	0.88	0.12; 6.47
		1 patient/licensed nurse			1	1 UAP hour/patient day		
					1	1 licensed hour/patient day		
Length of stay	5	1 RN FTE/patient day	0.92	0.80; 1.05	4*	1 nurse hour/patient day		
	1	1 patient/LPN/shift	0.98	0.97; 0.99	3	1 RN hour/patient day	1.00	0.41; 2.42
		1 patient/UAP/shift			2	1 LPN hour/patient day		
		1 patient/licensed nurse			1	1 UAP hour/patient day		
					2	1 licensed hour/patient day		
Patient falls, injuries	1	1 RN FTE/patient day			2	1 nurse hour/patient day		
	1	1 patient/LPN/shift			1	1 RN hour/patient day		
		1 patient/UAP/shift				1 LPN hour/patient day		
	1	1 patient/licensed nurse				1 UAP hour/patient day		
						1 licensed hour/patient day		
Pressure ulcers		1 RN FTE/patient day			4	1 nurse hour/patient day		
		1 patient/LPN/shift			1	1 RN hour/patient day		
		1 patient/UAP/shift			1	1 LPN hour/patient day		
	1	1 patient/licensed nurse			1	1 UAP hour/patient day		
					1	1 licensed hour/patient day		
Nosocomial infection rate	3	1 RN FTE/patient day	0.88	0.73; 1.06	5*	1 nurse hour/patient day	0.88	0.84; 0.92
		1 patient/LPN/shift			2*	1 RN hour/patient day	0.76	1.05; 0.68
	1	1 patient/UAP/shift			1	1 LPN hour/patient day		
		1 patient/licensed nurse			1	1 UAP hour/patient day		
					2	1 licensed hour/patient day		
Failure to rescue	6	1 RN FTE/patient day	0.91	0.89; 0.94	1	1 nurse hour/patient day		
		1 patient/LPN/shift			3	1 RN hour/patient day		
		1 patient/UAP/shift			1	1 LPN hour/patient day		
		1 patient/licensed nurse			1	1 UAP hour/patient day		
					2	1 licensed hour/patient day		
Urinary tract infection rate	2	1 RN FTE/patient day	1.02	0.94; 1.11	5	1 nurse hour/patient day		
	1	1 patient/LPN/shift	0.96	0.94; 0.99	6	1 RN hour/patient day	1.00	0.64; 1.56
		1 patient/UAP/shift			4	1 LPN hour/patient day	1.04	0.17; 6.26
	1	1 patient/licensed nurse			1	1 UAP hour/patient day		
					2	1 licensed hour/patient day		
Surgical bleeding	1	1 RN FTE/patient day	1.02	0.78; 1.34	4	1 nurse hour/patient day		
		1 patient/LPN/shift			2	1 RN hour/patient day	1.00	0.95; 1.05
		1 patient/UAP/shift			1	1 LPN hour/patient day	0.93	0.00; 233.29
		1 patient/licensed nurse			1	1 UAP hour/patient day		
					2	1 licensed hour/patient day		

Table 23. Relative risk of mortality and nurse sensitive patient outcomes corresponding to one unit increase in nurse staffing ratios and hours (pooled estimates) (continued)

Outcome	N	Increment	RR	95% CI	N	Increment	RR	95% CI
Upper gastrointestinal bleeding		1 RN FTE/patient day			1	1 nurse hour/patient day		
		1 patient/LPN/shift			3	1 RN hour/patient day		
		1 patient/UAP/shift			1	1 LPN hour/patient day		
		1 patient/licensed nurse			1	1 UAP hour/patient day		
					2	1 licensed hour/patient day		
Post surgical thrombosis	1	1 RN FTE/patient day			2	1 nurse hour/patient day		
		1 patient/LPN/shift			1	1 RN hour/patient day		
		1 patient/UAP/shift			2	1 LPN hour/patient day		
		1 patient/licensed nurse			1	1 UAP hour/patient day		
					1	1 licensed hour/patient day		
Atelectasis and pulmonary failure	5	1 RN FTE/patient day	0.94	0.93; 0.94	2	1 nurse hour/patient day		
	1	1 patient/LPN/shift			2	1 RN hour/patient day	1.08	0.85; 1.37
		1 patient/UAP/shift			2	1 LPN hour/patient day		
	1	1 patient/licensed nurse			1	1 UAP hour/patient day		
					1	1 licensed hour/patient day		
Accidental extubation	5	1 RN FTE/patient day	0.49	0.36; 0.67		1 nurse hour/patient day		
		1 patient/LPN/shift				1 RN hour/patient day		
		1 patient/UAP/shift				1 LPN hour/patient day		
		1 patient/licensed nurse				1 UAP hour/patient day		
						1 licensed hour/patient day		
Hospital acquired pneumonia	4	1 RN FTE/patient day	0.81	0.67; 0.98	5	1 nurse hour/patient day		
	2	1 patient/LPN/shift			4	1 RN hour/patient day		
		1 patient/UAP/shift			3	1 LPN hour/patient day		
	1	1 patient/licensed nurse				1 UAP hour/patient day		
					2	1 licensed hour/patient day		
Postoperative infection	1	1 RN FTE/patient day	1.01	0.70; 1.45	4	1 nurse hour/patient day	1.00	0.99; 1.01
	1	1 patient/LPN/shift			2	1 RN hour/patient day	1.00	0.95; 1.05
		1 patient/UAP/shift			1	1 LPN hour/patient day	0.93	0.00; 233.29
		1 patient/licensed nurse			1	1 UAP hour/patient day		
					2	1 licensed hour/patient day		
Cardiac arrest/shock	3	1 RN FTE/patient day	0.72	0.62; 0.84		1 nurse hour/patient day		
		1 patient/LPN/shift				1 RN hour/patient day		
		1 patient/UAP/shift				1 LPN hour/patient day		
		1 patient/licensed nurse				1 UAP hour/patient day		
					1	1 licensed hour/patient day		
Complications (medical)	3	1 RN FTE/patient day	0.72	0.60; 0.86	2	1 nurse hour/patient day		
		1 patient/LPN/shift				1 RN hour/patient day		
		1 patient/UAP/shift				1 LPN hour/patient day		
		1 patient/licensed nurse				1 UAP hour/patient day		
					1	1 licensed hour/patient day		

* significant heterogeneity between studies

Table 24. Consistent across the studies, significant association between nurse staffing and patient outcomes (results from pooled analysis), attributable to nurse staffing proportion of events, and number of avoided events per 1,000 hospitalized patients

Outcome	Nurse Staffing	Studies	RR	95% CI	Attributable to Nurse Staffing Fraction, %	95%CI	Number of Avoided (excessive) Events/1,000 Hospitalized	95%CI
All Patients								
Mortality	Increase by 1 patient/RN/shift	6	1.08	1.08; 1.09	7.56	7.07; 8.04	5	4; 5
Mortality, hospital level analysis	Increase by 1 RN FTE/patient day	5	0.96	0.94; 0.98	4.2	6; 2.4	3	2; 4
Mortality, ICUs	Increase by 1 RN FTE/patient day	5	0.91	0.86; 0.96	9.2	14.4; 3.7	5	2; 8
Mortality, surgical patients	Increase by 1 RN FTE/patient day	8	0.84	0.8; 0.89	16	20.2; 11.5	6	4; 8
Mortality, medical patients	Increase by 1 RN FTE/patient day	6	0.94	0.94; 0.95	5.6	6.3; 4.8	5	4; 5
Mortality, ICUs	Increase by 1 RN hour/patient day	5	0.99	0.99; 0.99	0.5	0.7; 0.3	0	0.2; 0
Mortality, surgical patients	Increase by 1 RN hour/patient day	9	0.99	0.98; 1	1.4	2.5; 0.3	1	0; 1
Mortality, medical patients	Increase by 1 RN hour/patient day	10	0.99	0.99; 1	0.7	0.8; 0.5	1	0; 1
Hospital acquired pneumonia	Increase by 1 patient/RN/shift	3	1.07	1.03; 1.11	6.5	2.9; 9.9	2	1; 3
Failure to rescue	Increase by 1 patient/RN/shift	3	1.08	1.07; 1.09	7.4	6.5; 8.3	12	11; 13
Pulmonary failure	Increase by 1 patient/RN/shift	4	1.53	1.24; 1.89	34.6	19.4; 47.1	6	3; 10
Unplanned extubation	Increase by 1 patient/RN/shift	5	1.45	1.27; 1.67	31.0	21.3; 40.1	5	3; 8
CPR	Increase by 1 patient/RN/shift	3	1.16	1.05; 1.29	13.8	4.8; 22.5	1	1; 2
Medical complications	Increase by 1 patient/RN/shift	3	1.17	1.04; 1.31	14.5	3.8; 23.7	37	9; 64
Hospital acquired pneumonia	Increase by 1 RN FTE/patient day	4	0.81	0.67; 0.98	19.1	33.1; 2.1	1	0; 2
Pulmonary failure	Increase by 1 RN FTE/patient day	5	0.94	0.94; 0.94	6	6.4; 5.6	1	1; 1
CPR	Increase by 1 RN FTE/patient day	5	0.72	0.62; 0.84	27.6	37.9; 15.6	2	1; 2
ICUs								
Hospital acquired pneumonia	Increase by 1 RN FTE/patient day	3	0.7	0.56; 0.88	30.2	44.3; 12.4	7	3; 10
Pulmonary failure	Increase by 1 RN FTE/patient day	4	0.4	0.27; 0.59	60.3	73.4; 40.6	7	5; 9
Unplanned extubation	Increase by 1 RN FTE/patient day	5	0.49	0.36; 0.67	50.9	63.7; 33.5	6	4; 8
CPR	Increase by 1 RN FTE/patient day	3	0.72	0.62; 0.84	27.6	37.9; 15.6	2	1; 2
Nosocomial Infection	Increase by 1 hour in total nurse hours/patient day	3	0.87	0.82; 0.92	12.9	17.6; 8	10	6; 13
Relative change in LOS	Increase by 1 RN FTE/patient day	4	0.76	0.62; 0.94	24	38; 6	7	2; 11
Surgical patients								
Failure to rescue	Increase by 1 RN FTE/patient day	5	0.84	0.79; 0.9	16	21.4; 10.3	26	17; 35
Surgical wound infection	Increase by 1 RN FTE/patient day	1	0.15	0.03; 0.82	84.5	97.1; 18.1	7	1; 8
Sepsis	Increase by 1 RN FTE/patient day	5	0.64	0.46; 0.89	36	54; 11	4	2; 6
Relative change in LOS	Increase by 1 RN FTE/patient day	3	0.69	0.55; 0.86	31	45; 14	14	6; 21

References and Included Studies

1. National Center for Health Workforce Analysis. Projected supply, demand, and shortages of registered nurses: 2000-2020. National Center for Health Workforce Analysis (U.S.). Rockville, MD: U.S. Dept. of Health and Human Services, Health Resources and Services Administration, Bureau of Health Professions, National Center for Health Workforce Analysis; 2002.
2. United States Congress Senate Committee on Health Education Labor and Pensions. Addressing direct care staffing shortages: hearing before the Committee on Health, Education, Labor, and Pensions. S. hrg. 107-164 ed. Washington, D.C.: Superintendent of Documents, U.S. Government Printing Office; 2001.
3. Heinz D. Hospital nurse staffing and patient outcomes: a review of current literature. Dimens Crit Care Nurs Jan-Feb 2004;23(1):44-50.
4. Joint Commission on Accreditation of Healthcare Organizations. Joint Commission on Accreditation of Healthcare Organizations setting standard for quality in health care. Oak Brook Terrace, IL: Joint Commission on Accreditation of Healthcare Organizations; 1997.
5. National Quality Forum. National voluntary consensus standards for nursing-sensitive care: an initial performance measure set: a consensus report. Washington, D.C: National Quality Forum; 2004.
6. Needleman J, Buerhaus PI, Stewart M, et al. Nurse staffing in hospitals: is there a business case for quality? Health Aff (Millwood) Jan-Feb 2006;25(1):204-11.
7. Rothberg MB, Abraham I, Lindenauer PK, et al. Improving nurse-to-patient staffing ratios as a cost-effective safety intervention. Med Care Aug 2005;43(8):785-91.
8. Shortell SM, Zimmerman JE, Rousseau DM, et al. The performance of intensive care units: does good management make a difference? Med Care May 1994;32(5):508-25.
9. Pronovost PJ, Jenckes MW, Dorman T, et al. Organizational characteristics of intensive care units related to outcomes of abdominal aortic surgery. JAMA Apr 14 1999;281(14):1310-7.
10. Aiken LH, Sloane DM, Lake ET, et al. Organization and outcomes of inpatient AIDS care. Med Care Aug 1999;37(8):760-72.
11. Robertson RH, Hassan M. Staffing intensity, skill mix and mortality outcomes: the case of chronic obstructive lung disease. Health Serv Manage Res Nov 1999;12(4):258-68.
12. Silber JH, Kennedy SK, Even-Shoshan O, et al. Anesthesiologist direction and patient outcomes. Anesthesiology Jul 2000;93(1):152-63.
13. Amaravadi RK, Dimick JB, Pronovost PJ, et al. ICU nurse-to-patient ratio is associated with complications and resource use after esophagectomy. Intensive Care Med Dec 2000;26(12):1857-62.
14. Dimick JB, Swoboda SM, Pronovost PJ, et al. Effect of nurse-to-patient ratio in the intensive care unit on pulmonary complications and resource use after hepatectomy. Am J Crit Care Nov 2001;10(6):376-82.
15. Aiken LH, Clarke SP, Sloane DM, et al. Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. JAMA Oct 23-30 2002;288(16):1987-93.
16. Aiken LH, Clarke SP, Cheung RB, et al. Educational levels of hospital nurses and surgical patient mortality. JAMA Sep 24 2003;290(12):1617-23.
17. Person SD, Allison JJ, Kiefe CI, et al. Nurse staffing and mortality for Medicare patients with acute myocardial infarction. Med Care Jan 2004;42(1):4-12.
18. Mark BA, Harless DW, McCue M, et al. A longitudinal examination of hospital registered nurse staffing and quality of care. Health Serv Res Apr 2004;39(2):279-300.
19. Mark BA, Harless DW, McCue M. The impact of HMO penetration on the relationship between nurse staffing and quality. Health Econ Jul 2005;14(7):737-53.
20. Elting LS, Pettaway C, Bekele BN, et al. Correlation between annual volume of cystectomy, professional staffing, and outcomes: a statewide, population-based study. Cancer Sep 1 2005;104(5):975-84.
21. Halm M, Peterson M, Kandels M, et al. Hospital nurse staffing and patient mortality, emotional exhaustion, and job dissatisfaction. Clin Nurse Spec Sep-Oct 2005;19(5):241-51; quiz 52-4.
22. Hope J. Nosocomial infections and their relationship to nursing workload in an acute care hospital. [PhD]. Ottawa: Dissertation, Queen's University; 2003.

23. Pronovost PJ, Dang D, Dorman T, et al. Intensive care unit nurse staffing and the risk for complications after abdominal aortic surgery. Eff Clin Pract Sep-Oct 2001;4(5):199-206.
24. Dang D, Johantgen ME, Pronovost PJ, et al. Postoperative complications: does intensive care unit staff nursing make a difference? Heart Lung May-Jun 2002;31(3):219-28.
25. Marcin JP, Rutan E, Rapetti PM, et al. Nurse staffing and unplanned extubation in the pediatric intensive care unit. Pediatr Crit Care Med May 2005;6(3):254-7.
26. Needleman J, Buerhaus P, Mattke S, et al. Nurse-staffing levels and the quality of care in hospitals. N Engl J Med May 30 2002;346(22):1715-22.
27. Needleman J. Nurse staffing and patient outcomes in hospitals. Final Report for Health Resources Services Administration 2001; Contract No. 230990021.
28. Cho S-H. Nurse staffing and adverse patient outcomes. [PhD]: Dissertation, University of Michigan; 2002.
29. Blegen MA, Goode CJ, Reed L. Nurse staffing and patient outcomes. Nurs Res Jan-Feb 1998;47(1):43-50.
30. Berney BL. Use, trends, and impacts of nurse overtime in New York hospitals, 1995-2000. [PhD]: Dissertation, Boston University; 2003.
31. Berney B, Needleman J. Impact of nursing overtime on nurse-sensitive patient outcomes in New York hospitals, 1995-2000. Policy Polit Nurs Pract May 2006;7(2):87-100.
32. Seago JA, Ash M. Registered nurse unions and patient outcomes. J Nurs Adm Mar 2002;32(3):143-51.
33. Unruh LY. The impact of hospital nurse staffing on the quality of patient care. [PhD]: Dissertation, University of Notre Dame; 2000.
34. Bond CA, Raehl CL, Pitterle ME, et al. Health care professional staffing, hospital characteristics, and hospital mortality rates. Pharmacotherapy Feb 1999;19(2):130-8.
35. Houser EP. Nurse staffing levels and patient outcomes. [DNSc]: Dissertation, Johns Hopkins University; 2005.
36. Zidek CK. Assessment of nursing care quality and the judgment of the professional nurse as reflected in nurse-determined patient acuity classification and staffing decisions. [PhD]: Dissertation, Indiana University of Pennsylvania; 2003.
37. Xu Y, Kwak C. Characteristics of internationally educated nurses in the United States. Nurs Econ Sep-Oct 2005;23(5):233-8, 11.
38. Dicicco-Bloom B. The racial and gendered experiences of immigrant nurses from Kerala, India. J Transcult Nurs Jan 2004;15(1):26-33.
39. Yi M, Jezewski MA. Korean nurses' adjustment to hospitals in the United States of America. J Adv Nurs Sep 2000;32(3):721-9.
40. Crawford L. Nurses educated in other countries: coming to America. JONAS Healthc Law Ethics Regul Jul-Sep 2004;6(3):66-8.
41. Flynn L, Aiken LH. Does international nurse recruitment influence practice values in U.S. hospitals? J Nurs Scholarsh 2002;34(1):67-73.
42. Pizer CM, Collard AF, James SM, et al. Nurses' job satisfaction: are there differences between foreign and U.S.-educated nurses? Image J Nurs Sch Winter 1992;24(4):301-6.
43. Berney B, Needleman J. Trends in nurse overtime, 1995-2002. Policy Polit Nurs Pract Aug 2005;6(3):183-90.
44. Berney B, Needleman J, Kovner C. Factors influencing the use of registered nurse overtime in hospitals, 1995-2000. J Nurs Scholarsh 2005;37(2):165-72.
45. Cimiotti JP. Nurse staffing and healthcare-associated infections in the neonatal ICU. [PhD]. Ann Arbor, MI: Dissertation, Columbia University; 2004.
46. Robert J, Fridkin SK, Blumberg HM, et al. The influence of the composition of the nursing staff on primary bloodstream infection rates in a surgical intensive care unit. Infect Control Hosp Epidemiol Jan 2000;21(1):12-7.
47. Alonso-Echanove J, Edwards JR, Richards MJ, et al. Effect of nurse staffing and antimicrobial-impregnated central venous catheters on the risk for bloodstream infections in intensive care units. Infect Control Hosp Epidemiol Dec 2003;24(12):916-25.
48. Oster CAH. The relationships between emergency department staffing and clinical outcomes of the acute myocardial infarction patient. [PhD]: Dissertation, University of Colorado; 2002.
49. Whitman GR, Kim Y, Davidson LJ, et al. The impact of staffing on patient outcomes across specialty units. J Nurs Adm Dec 2002;32(12): 633-9.
50. Bloom JR, Alexander JA, Nuchols BA. Nurse staffing patterns and hospital efficiency in the United States. Soc Sci Med Jan 1997;44(2):147-55.

51. United States Agency for Healthcare Research and Quality, University of California San Francisco-Stanford Evidence-Based Practice Center. Hospital Nurse Staffing and Quality of Care. Agency for Healthcare Research and Quality. Available at: http://www.ahrq.gov/research/nursestaffing/nursestaff.htm , 2006.
52. Aiken LH, Smith HL, Lake ET. Lower Medicare mortality among a set of hospitals known for good nursing care. Med Care Aug 1994;32(8):771-87.
53. Buchan J. Lessons from America? US magnet hospitals and their implications for UK nursing. J Adv Nurs Feb 1994;19(2):373-84.
54. Goode CJ, Krugman ME, Smith K, et al. The pull of magnetism: a look at the standards and the experience of a western academic medical center hospital in achieving and sustaining Magnet status. Nurs Adm Q Jul-Sep 2005;29(3):202-13.
55. Lake ET. Development of the practice environment scale of the Nursing Work Index. Res Nurs Health Jun 2002;25(3):176-88.
56. Lake ET, Friese CR. Variations in nursing practice environments: relation to staffing and hospital characteristics. Nurs Res Jan-Feb 2006;55(1):1-9.
57. Laschinger HK, Almost J, Tuer-Hodes D. Workplace empowerment and magnet hospital characteristics: making the link. J Nurs Adm Jul-Aug 2003;33(7-8):410-22.
58. Taylor NT. The Magnetic pull: does your facility have what it takes to attain Magnet recognition? Nurs Manage Sep 2004;35(9):68-81.
59. Robinson CA. Magnet nursing services recognition: transforming the critical care environment. AACN Clin Issues Aug 2001;12(3):411-23.
60. Kravitz RL, Sauvé MJ. Hospital Nursing Staff Ratios and Quality of Care. Final Report on Evidence, Administrative Data, an Expert Panel Process, and a Hospital Staffing Survey. Center for Health Services Research in Primary Care. 2006. Available at: http://repositories.cdlib.org/chsrpc/cdhs/Final
61. Bolton LB, Jones D, Aydin CE, et al. A response to California's mandated nursing ratios. J Nurs Scholarsh 2001;33(2):179-84.
62. Cho SH, Ketefian S, Barkauskas VH, et al. The effects of nurse staffing on adverse events, morbidity, mortality, and medical costs. Nurs Res Mar-Apr 2003;52(2):71-9.
63. Cheung RB. The relationship between nurse staffing, nursing time, and adverse events in an acute care hospital. [PhD]: Dissertation, University of South Florida; 2002.
64. Donaldson N, Bolton LB, Aydin C, et al. Impact of California's licensed nurse-patient ratios on unit-level nurse staffing and patient outcomes. Policy Polit Nurs Pract Aug 2005;6(3):198-210.
65. Donaldson NE, Brown DS, Bolton LB, et al. Unit Level Nurse Workload Impacts on Patient Safety. The Agency for Healthcare Research and Quality Working Conditions Grant Initiative 2004;Grant R01 # HS11954.
66. Dugan J, Lauer E, Bouquot Z, et al. Stressful nurses: the effect on patient outcomes. J Nurs Care Qual Apr 1996;10(3):46-58.
67. Taunton RL, Kleinbeck SV, Stafford R, et al. Patient outcomes. Are they linked to registered nurse absenteeism, separation, or work load? J Nurs Adm Apr 1994;24(4 Suppl):48-55.
68. Berger AM, Eilers JG, Pattrin L, et al. Advanced practice roles for nurses in tomorrow's healthcare systems. Clin Nurse Spec Sep 1996;10(5):250-5.
69. Brooten D, Youngblut JM. Nurse dose as a concept. J Nurs Scholarsh 2006;38(1):94-9.
70. Gardiner WC. Documenting JCAHO standards in assigning nursing staff. J Healthc Qual Jul-Aug 1992;14(4):50-3.
71. Lookinland S, Crenshaw J. Rewarding clinical competence in the ICU: using outcomes to reward performance. Dimens Crit Care Nurs Jul-Aug 1996;15(4):206-15.
72. Proehl JA. Developing emergency nursing competence. Nurs Clin North Am Mar 2002;37(1):89-96, vii.
73. Cruickshank JF, MacKay RC, Matsuno K, et al. Appraisal of the clinical competence of registered nurses in relation to their designated levels in the Western Australian nursing career structure. Int J Nurs Stud Jun 1994;31(3):217-30.
74. Institute of Medicine, Committee on the Work Environment for Nurses and Patient Safety, NetLibrary Inc. Keeping patients safe: transforming the work environment of nurses. A report of the Committee on the Work Environment for Nurses and Patient Safety Board on Health Care Services. Washington, DC: National Academy Press; 2004.
75. Potter P, Barr N, McSweeney M, et al. Identifying nurse staffing and patient outcome relationships: a guide for change in care delivery. Nurs Econ Jul-Aug 2003;21(4):158-66.
76. Ritter-Teitel J. An exploratory study of a predictive model for nursing-sensitive patient outcomes derived from patient care unit structure and process variables. [PhD]: Dissertation, University of Pennsylvania; 2001.
77. Tallier PC. Nurse staffing ratios and patient outcomes. [PhD]: Dissertation, Columbia University; 2003.

78. Sovie MD, Jawad AF. Hospital restructuring and its impact on outcomes: nursing staff regulations are premature. J Nurs Adm Dec 2001;31(12): 588-600.
79. Cimiotti JP, Haas J, Saiman L, et al. Impact of staffing on bloodstream infections in the neonatal intensive care unit. Arch Pediatr Adolesc Med Aug 2006;160(8):832-6.
80. Stegenga J, Bell E, Matlow A. The role of nurse understaffing in nosocomial viral gastrointestinal infections on a general pediatrics ward. Infect Control Hosp Epidemiol Mar 2002;23(3):133-6.
81. American Nurses Association. Implementing Nursing's Report Card. A Study of RN Staffing, Length of Stay and Patient Outcomes. Washington, DC: American Nurses Publishing; 1997.
82. Shamian J, Hagen B, Hu TW, et al. The relationship between length of stay and required nursing care hours. J Nurs Adm Jul-Aug 1994;24(7-8):52-8.
83. Halpine S, Maloney S. Tracing the missing link between nursing workload and case mix groups: a validation study. Healthc Manage Forum Fall 1993;6(3):19-26.
84. Kohn LT, Corrigan, J, Donaldson, MS,. To err is human: building a safer health system. A report of the Committee on Quality of Health Care in America. Washington, DC: Institute of Medicine, National Academy Press; 2000.
85. Institute of Medicine, Committee on Data Standards for Patient Safety, NetLibrary Inc. Patient Safety: Achieving a New Standard for Care. Washington, DC: Institute of Medicine: National Academy Press; 2004.
86. Unruh LY, Fottler MD, Talbott LL. Improving nurse staffing measures: discharge day measurement in "adjusted patient days of care." Inquiry Fall 2003;40(3):295-304.
87. United States Agency for Healthcare Research and Quality. National healthcare quality report. Washington, DC: National Academy Press; 2003.
88. Minnick AF, Roberts MJ, Young WB, et al. What influences patients' reports of three aspects of hospital services? Med Care Apr 1997;35(4):399-409.
89. Savitz LA, Jones CB, Bernard S. Quality Indicators Sensitive to Nurse Staffing in Acute Care Settings. Agency for Helthcare Research and Quality, Rockville, MD, Advances in Patient Safety: From Research to Implementation 2005;1-4(AHRQ Publication No. 050021):375-85.
90. United States; Agency for Healthcare Research and Quality; University of California SF-SE-BPC. Making health care safer: a critical analysis of patient safety practices. Vol Chapter 39. Nurse Staffing, Models of Care Delivery, and Interventions. Rockville, MD: Agency for Healthcare Research and Quality; 2001.
91. Buerhaus PI, Staiger DO, Auerbach DI. Implications of an aging registered nurse workforce. JAMA Jun 14 2000;283(22):2948-54.
92. Lang TA, Hodge M, Olson V, et al. Nurse-patient ratios: a systematic review on the effects of nurse staffing on patient, nurse employee, and hospital outcomes. J Nurs Adm Jul-Aug 2004;34(7-8):326-37.
93. Lankshear AJ, Sheldon TA, Maynard A. Nurse staffing and healthcare outcomes: a systematic review of the international research evidence. ANS Adv Nurs Sci Apr-Jun 2005;28(2):163-74.
94. Unruh L. Licensed nurse staffing and adverse events in hospitals. Med Care Jan 2003;41(1): 142-52.
95. American Nurses Association. Nursing-sensitive quality indicators for acute care settings and ANA's safety and quality initiative. Washington, D.C: American Nurses Association; 1999.
96. Clark AP. Nurse staffing levels and prevention of adverse events. Clin Nurse Spec Sep 2002;16(5):237-8.
97. Cho SH. Nurse staffing and adverse patient outcomes: a systems approach. Nurs Outlook Mar-Apr 2001;49(2):78-85.
98. Garretson S. Nurse to patient ratios in American health care. Nurs Stand 2004;19(14-16):33-7.
99. Lewis KK. Nurse-to-patient ratios: research and reality. Issue Brief (Mass Health Policy Forum) Mar 30 2005(25):1-19.
100. Arnow P, Allyn PA, Nichols EM, et al. Control of methicillin-resistant Staphylococcus aureus in a burn unit: role of nurse staffing. J Trauma Nov 1982;22(11):954-9.
101. Estabrooks CA, Midodzi WK, Cummings GG, et al. The impact of hospital nursing characteristics on 30-day mortality. Nurs Res Mar-Apr 2005;54(2):74-84.
102. Kovner CT. State regulation of RN-to-patient ratios. Am J Nurs Nov 2000;100(11):61-3, 5.
103. To amend title XVIII of the Social Security Act to provide for patient protection by establishing minimum nurse staffing ratios at certain Medicare providers, and for other purposes. Registered Nurse Safe Staffing Act of 2005 1. 109th Congress 1st Session ed; 2005.
104. Clarke SP. The policy implications of staffing-outcomes research. J Nurs Adm Jan 2005;35(1):17-9.

105. McCue M, Mark BA, Harless DW. Nurse staffing, quality, and financial performance. J Health Care Finance Summer 2003;29(4):54-76.
106. Sims CE. Increasing clinical, satisfaction, and financial performance through nurse-driven process improvement. J Nurs Adm Feb 2003;33(2):68-75.
107. Sincox AK. Mandatory overtime can hurt a hospital's financial status. Mich Nurse Nov 2004;77(9):9.
108. Cavouras CA. Nurse staffing levels in American hospitals: a 2001 report. J Emerg Nurs Feb 2002;28(1):40-3.
109. Hodge MB, Romano PS, Harvey D, et al. Licensed caregiver characteristics and staffing in California acute care hospital units. J Nurs Adm Mar 2004;34(3):125-33.
110. Unruh LY, Fottler MD. Patient turnover and nursing staff adequacy. Health Serv Res Apr 2006;41(2):599-612.
111. Bordoloi SK, Weatherby EJ. Managerial implications of calculating optimal nurse staffing in medical units. Aspens Advis Nurse Exec Jul 2000;15(10):1-12.
112. Urbanowicz JA. An evaluation of an acuity system as it applies to a cardiac catheterization laboratory. Comput Nurs May-Jun 1999;17(3):129-34.
113. Botter ML. The use of information generated by a patient classification system. J Nurs Adm Nov 2000;30(11):544-51.
114. Hall LM, Pink GH, Johnson LM, et al. Development of a nursing management practice atlas. Part 2, Variation in use of nursing and financial resources. J Nurs Adm Sep 2000;30(9):440-8.
115. Rozich JD, Resar RK. Using a unit assessment tool to optimize patient flow and staffing in a community hospital. Jt Comm J Qual Improv Jan 2002;28(1):31-41.
116. The Interagency Collaborative on Nursing Statistics. Nurses, Nursing Education, and Nursing Workforce: Definitions. December 2005. Available at: http://www.iconsdata.org/index.htm, 2006.
117. Silber JH, Williams SV, Krakauer H, et al. Hospital and patient characteristics associated with death after surgery. A study of adverse occurrence and failure to rescue. Med Care Jul 1992;30(7):615-29.
118. Higgins J, Green S. The Cochrane Collaboration. The Cochrane handbook for systematic reviews of interventions. John Wiley & Sons, Ltd. Cochrane Collaboration. Available at: http://www.cochrane.org/resources/handbook/handbook.pdf, 2006.
119. United States Agency for Healthcare Research and Quality; University of California SF-SE-BPC. Systems to Rate the Strength of Scientific Evidence: Rockville, MD; 2002.
120. Hamer S, Collinson G. Achieving evidence-based practice: a handbook for practitioners. Edinburgh: B. Tindall; 1999.
121. Dawson B, Trapp RG. Basic & Clinical Biostatistics (LANGE Basic Science). 3rd ed. New York: Lange Medical Books-McGraw-Hill; 2004.
122. Kahn HA, Sempos CT. Statistical Methods in Epidemiology (Monographs in Epidemiology and Biostatistics). USA: Oxford University Press; 1989.
123. Al-Marzouki S, Evans S, Marshall T, et al. Are these data real? Statistical methods for the detection of data fabrication in clinical trials. BMJ July 30 2005;331(7511):267-70.
124. Buyse M, George SL, Evans S, et al. The role of biostatistics in the prevention, detection and treatment of fraud in clinical trials. Statistics in Medicine 1999;18(24):3435-51.
125. Stroup DF, Berlin JA, Morton SC, et al. Meta-analysis of observational studies in epidemiology: a proposal for reporting. Meta-analysis Of Observational Studies in Epidemiology (MOOSE) group. JAMA Apr 19 2000;283(15):2008-12.
126. Duval S, Tweedie R. Trim and fill: A simple funnel-plot-based method of testing and adjusting for publication bias in meta-analysis. Biometrics Jun 2000;56(2):455-63.
127. Vist GE, Hagen KB, Devereaux P, et al. Outcomes of patients who participate in randomised controlled trials compared to similar patients receiving similar interventions who do not participate. The Cochrane Database of Methodology Reviews, John Wiley & Sons, Ltd 2005;3.
128. DerSimonian R, Laird N. Meta-analysis in clinical trials. Control Clin Trials Sep 1986;7(3):177-88.
129. American Nurses Association. Nurse Staffing and Patient Outcomes: In the Inpatient Hospital Setting. Washington DC: American Nurses Association; 2000.

130. Spetz J. Minimum nurse staffing ratios in California acute care hospitals. San Francisco: California Workforce Initiative; 2000.
131. Viechtbauer W. Confidence intervals for the amount of heterogeneity in meta-analysis. Stat Med Feb 6 2006.
132. Knapp G, Biggerstaff BJ, Hartung J. Assessing the amount of heterogeneity in random-effects meta-analysis. Biom J Apr 2006;48(2):271-85.
133. Knapp G, Hartung J. Improved tests for a random effects meta-regression with a single covariate. Stat Med Sep 15 2003;22(17):2693-710.
134. Egger M, Smith GD, Altman DG. Systematic Reviews in Health Care. London: NetLibrary, Inc. BMJ Books; 2001.
135. Peters JL, Sutton AJ, Jones DR, et al. Comparison of two methods to detect publication bias in meta-analysis. JAMA Feb 8 2006;295(6):676-80.
136. Littell RC, Milliken GA, Stroup WW, et al. SAS System for Mixed Models: SAS Publishing; 1996.
137. Hartemink N, Boshuizen HC, Nagelkerke NJD, et al. Combining Risk Estimates from Observational Studies with Different Exposure Cutpoints: A Meta-analysis on Body Mass Index and Diabetes Type 2. Am. J. Epidemiol. June 1 2006;163(11):1042-52.
138. Kovner C, Jones CB, Gergen PJ. Nurse Staffing in Acute Care Hospitals,1990-1996. Policy, Politics, & Nursing Practice 2000;1(3):194-204.
139. Blegen MA, Vaughn T. A multisite study of nurse staffing and patient occurrences. Nurs Econ Jul-Aug 1998;16(4):196-203.
140. Tourangeau AE, Giovannetti P, Tu JV, et al. Nursing-related determinants of 30-day mortality for hospitalized patients. Can J Nurs Res Mar 2002;33(4):71-88.
141. Thorson MJ. Hours of nursing care: Relationship to patient outcomes. [PhD]: Dissertation, University of North Carolina at Chapel Hill; 1995.
142. Kahn KL, Brook RH, Draper D, et al. Interpreting hospital mortality data. How can we proceed? JAMA Dec 23-30 1988;260(24):3625-8.
143. Rosenthal GE, Baker DW, Norris DG, et al. Relationships between in-hospital and 30-day standardized hospital mortality: implications for profiling hospitals. Health Serv Res Mar 2000;34(7):1449-68.
144. United States Health Resources and Services Administration Division of Nursing. The registered nurse population. March 2000, findings from the National Sample Survey of Registered Nurses. Rockville, MD: U.S. Dept. of Health & Human Services, Public Health Service, Health Resources and Services Administration, Bureau of Health Professions, Division of Nursing; 2000.
145. Boyle SM. Nursing unit characteristics and patient outcomes. Nurs Econ May-Jun 2004;22(3):111-9, 23, 07.
146. Flood SD, Diers D. Nurse staffing, patient outcome and cost. Nurs Manage May 1988;19(5):34-5, 8-9, 42-3.
147. Fridkin SK, Pear SM, Williamson TH, et al. The role of understaffing in central venous catheter-associated bloodstream infections. Infect Control Hosp Epidemiol Mar 1996;17(3):150-8.
148. Centers for Disease Control (U.S.). WISQARS Injury Mortality Reports. 1999-2003. Dept. of Health & Human Services, Public Health Service, Centers for Disease Control. Available at: http://www.cdc.gov/ncipc/, 2006.
149. Gandjour A. The effect of managed care penetration on hospital staffing in Tennessee, 1991-1995. Manag Care Interface Sep 2000;13(9):62-6, 70.
150. Shultz Beckman JA. The effectiveness of nursing practice patterns in acute care nursing sub-units. [PhD]. Ann Arbor, MI, University of North Carolina at Chapel Hill; 2003.
151. Lichtig LK, Knauf RA, Milholland DK. Some impacts of nursing on acute care hospital outcomes. J Nurs Adm Feb 1999;29(2):25-33.
152. Upenieks VV. What constitutes effective leadership? Perceptions of magnet and nonmagnet nurse leaders. J Nurs Adm Sep 2003;33(9):456-67.
153. Blegen MA, Vaughn TE, Goode CJ. Nurse experience and education: effect on quality of care. J Nurs Adm Jan 2001;31(1):33-9.
154. Seago JA, Williamson A, Atwood C. Longitudinal analyses of nurse staffing and patient outcomes: more about failure to rescue. J Nurs Adm Jan 2006;36(1):13-21.
155. Langemo DK, Anderson J, Volden CM. Nursing quality outcome indicators. The North Dakota Study. J Nurs Adm Feb 2002;32(2):98-105.
156. Langemo DK, Anderson J, Volden C. Uncovering pressure ulcer incidence. Nurs Manage Oct 2003;34(10):54-7.

157. Kovner C, Gergen PJ. Nurse staffing levels and adverse events following surgery in U.S. hospitals. Image J Nurs Sch 1998;30(4):315-21.
158. Kovner C, Jones C, Zhan C, et al. Nurse staffing and postsurgical adverse events: an analysis of administrative data from a sample of U.S. hospitals, 1990-1996. Health Serv Res Jun 2002;37(3):611-29.
159. Needleman J, Buerhaus PI, Mattke S, et al. Measuring hospital quality: can Medicare data substitute for all-payer data? Health Serv Res Dec 2003;38(6 Pt 1):1487-508.
160. Aiken LH, Sloane DM, Sochalski J. Hospital organisation and outcomes. Qual Health Care Dec 1998;7(4):222-6.
161. Ridge RA. The relationship between patient satisfaction with nursing care and nurse staffing. [PhD]: Dissertation, University of Virginia; 2001.
162. Seago JA, Spetz J, Mitchell S. Nurse staffing and hospital ownership in California. J Nurs Adm May 2004;34(5):228-37.
163. Sochalski J. Is more better?: the relationship between nurse staffing and the quality of nursing care in hospitals. Med Care Feb 2004;42(2 Suppl):II67-73.
164. Vahey DC, Aiken LH, Sloane DM, et al. Nurse burnout and patient satisfaction. Med Care Feb 2004;42(2 Suppl):II57-66.
165. Barkell NP, Killinger KA, Schultz SD. The relationship between nurse staffing models and patient outcomes: a descriptive study. Outcomes Manag Jan-Mar 2002;6(1):27-33.
166. Seago JA. Evaluation of a hospital work redesign: patient-focused care. J Nurs Adm Nov 1999;29(11):31-8.
167. McGillis Hall L, Doran D, Baker GR, et al. Nurse staffing models as predictors of patient outcomes. Med Care Sep 2003;41(9):1096-109.
168. McGillis Hall L, Doran D, Pink GH. Nurse staffing models, nursing hours, and patient safety outcomes. J Nurs Adm Jan 2004;34(1):41-5.
169. Hall LM, Doran D. Nurse staffing, care delivery model, and patient care quality. J Nurs Care Qual Jan-Mar 2004;19(1):27-33.
170. Dunton N, Gajewski B, Taunton RL, et al. Nurse staffing and patient falls on acute care hospital units. Nurs Outlook Jan-Feb 2004;52(1):53-9.
171. Mark BA, Salyer J, Wan TT. Market, hospital, and nursing unit characteristics as predictors of nursing unit skill mix: a contextual analysis. J Nurs Adm Nov 2000;30(11):552-60.
172. Brewer CS, Frazier P. The influence of structure, staff type, and managed-care indicators on registered nurse staffing. J Nurs Adm Sep 1998;28(9):28-36.
173. Rogers AE, Hwang WT, Scott LD, et al. The working hours of hospital staff nurses and patient safety. Health Aff (Millwood) Jul-Aug 2004;23(4):202-12.
174. Trinkoff A, Geiger-Brown J, Brady B, et al. How long and how much are nurses now working? Am J Nurs Apr 2006;106(4):60-71, quiz 2.
175. Gold DR, Rogacz S, Bock N, et al. Rotating shift work, sleep, and accidents related to sleepiness in hospital nurses. Am J Public Health Jul 1992;82(7):1011-4.
176. Ruggiero JS. Correlates of fatigue in critical care nurses. Res Nurs Health Dec 2003;26(6):434-44.
177. Skipper JKJ, Jung FD, Coffey LC. Nurses and shiftwork: effects on physical health and mental depression. J Adv Nurs Jul 1990;15(7):835-42.
178. Hoffman AJ, Scott LD. Role stress and career satisfaction among registered nurses by work shift patterns. J Nurs Adm Jun 2003;33(6):337-42.
179. Hughes KK, Marcantonio RJ. Recruitment, retention, and compensation of agency and hospital nurses. J Nurs Adm Oct 1991;21(10): 46-52.
180. Hughes KK, Marcantonio RJ. The clinical practice of supplemental nursing personnel. Nurs Adm Q Spring 1993;17(3):83-7.
181. Warren IB, Rozell BR. Supplemental staffing. Nurse manager views of costs, benefits, and quality of care. J Nurs Adm Jun 1995;25(6):51-7.
182. Strzalka A, Havens DS. Nursing care quality: comparison of unit-hired, hospital float pool, and agency nurses. J Nurs Care Qual Jul 1996;10(4): 59-65.
183. Wetzel K, Soloshy DE, Gallagher DG. The work attitudes of full-time and part-time registered nurses. Health Care Manage Rev Summer 1990;15(3):79-85.
184. Burke RJ, Greenglass ER. Effects of hospital restructuring on full time and part time nursing staff in Ontario. Int J Nurs Stud Apr 2000;37(2):163-71.
185. Jolma DJ. Relationship between nursing work load and turnover. Nurs Econ Mar-Apr 1990;8(2):110-4.
186. Porter RT, Porter MJ. Career development: our professional responsibility. J Prof Nurs Jul-Aug 1991;7(4):208-12.
187. Havlovic SJ, Lau DC, Pinfield LT. Repercussions of work schedule congruence among full-time, part-time, and contingent nurses. Health Care Manage Rev Fall 2002;27(4):30-41.

188. Shader K, Broome ME, Broome CD, et al. Factors influencing satisfaction and anticipated turnover for nurses in an academic medical center. J Nurs Adm Apr 2001;31(4):210-6.
189. O'Brien-Pallas L, Shamian J, Thomson D, et al. Work-related disability in Canadian nurses. J Nurs Scholarsh 2004;36(4):352-7.
190. Hartz AJ, Krakauer H, Kuhn EM, et al. Hospital characteristics and mortality rates. N Engl J Med Dec 21 1989;321(25):1720-5.
191. Krakauer H, Bailey RC, Skellan KJ, et al. Evaluation of the HCFA model for the analysis of mortality following hospitalization. Health Serv Res 1992;27(3):317-35.
192. Simmonds KA. Nursing workload and its relationship to vancomycin-resistant enterococci colonization in chronic dialysis patients. [MSc]. Ottawa: Dissertation, University of Calgary; 2004.
193. Stratton KM. The relationship between pediatric nurse staffing and quality of care in the hospital setting. [PhD]. Denver: Dissertation, University of Colorado; 2005.
194. Grillo-Peck AM, Risner PB. The effect of a partnership model on quality and length of stay. Nurs Econ Nov-Dec 1995;13(6):367-72, 74.
195. Hoover KW. The impact of managed care penetration, hospital organizational variables and nurse staffing on hospital patient outcomes. [PhD]: Dissertation, Clinical Health Sciences, University of Mississippi Medical Center; 2000.
196. Shortell SM, Hughes EF. The effects of regulation, competition, and ownership on mortality rates among hospital inpatients. N Engl J Med Apr 28 1988;318(17):1100-7.
197. Melberg SE. Effects of changing skill mix. Nurs Manage Nov 1997;28(11):47-8.
198. Armstrong KJ, Laschinger H. Structural empowerment, Magnet hospital characteristics, and patient safety culture: making the link. J Nurs Care Qual Apr-Jun 2006;21(2):124-32, quiz 33-4.
199. Aiken LH, Havens DS, Sloane DM. The Magnet Nursing Services Recognition Program. Am J Nurs Mar 2000;100(3):26-35; quiz -6.
200. Bolton LB, Aydin CE, Donaldson N, et al. Nurse staffing and patient perceptions of nursing care. J Nurs Adm Nov 2003;33(11):607-14.
201. Leiter MP, Harvie P, Frizzell C. The correspondence of patient satisfaction and nurse burnout. Soc Sci Med Nov 1998;47(10):1611-7.
202. Kramer M, Schmalenberg C, Maguire P. Essentials of a magnetic work environment: part 3. Nursing Aug 2004;34(8):44-7.
203. Kramer M, Schmalenberg C. Revising the Essentials of Magnetism tool: there is more to adequate staffing than numbers. J Nurs Adm Apr 2005;35(4):188-98.
204. Spence Laschinger HK, Leiter MP. The impact of nursing work environments on patient safety outcomes: the mediating role of burnout/ engagement. J Nurs Adm May 2006;36(5):259-67.
205. Whitman GR, Davidson LJ, Sereika SM, et al. Staffing and pattern of mechanical restraint use across a multiple hospital system. Nurs Res Nov-Dec 2001;50(6):356-62.
206. Clarke SP. Research on nurse staffing and its outcomes: The challenges and risks of grasping at shadows. In: Nelson SG, S, ed. The complexities of care: nursing reconsidered. Ithaca, N.Y: ILR Press; 2006:161-84.
207. Adomat R, Hewison A. Assessing patient category/dependence systems for determining the nurse/patient ratio in ICU and HDU: a review of approaches. J Nurs Manag Sep 2004;12(5): 299-308.
208. Calligaro KD, Miller P, Dougherty MJ, et al. Role of nursing personnel in implementing clinical pathways and decreasing hospital costs for major vascular surgery. J Vasc Nurs Sep 1996;14(3):57-61.
209. Discher CL, Klein D, Pierce L, et al. Heart failure disease management: impact on hospital care, length of stay, and reimbursement. Congest Heart Fail Mar-Apr 2003;9(2):77-83.
210. Pitt HA, Murray KP, Bowman HM, et al. Clinical pathway implementation improves outcomes for complex biliary surgery. Surgery Oct 1999;126(4):751-6; discussion 6-8.
211. Smith DM, Gow P. Towards excellence in quality patient care: a clinical pathway for myocardial infarction. J Qual Clin Pract Jun 1999;19(2):103-5.
212. Van Doren ES, Bowman J, Landstrom GL, et al. Structure and process variables affecting outcomes for heart failure clients. Lippincotts Case Manag Jan-Feb 2004;9(1):21-6.
213. Thomas EJ, Sexton JB, Neilands TB, et al. Correction: The effect of executive walk rounds on nurse safety climate attitudes: A randomized trial of clinical units [ISRCTN85147255]. BMC Health Serv Res Jun 10 2005;5(1):46.
214. Thomas EJ, Sexton JB, Neilands TB, et al. The effect of executive walk rounds on nurse safety climate attitudes: a randomized trial of clinical units [ISRCTN85147255] [corrected]. BMC Health Serv Res Apr 11 2005;5(1):28.

215. Cronin-Stubbs D, Swanson B, Dean-Baar S, et al. The effects of a training program on nurses' functional performance assessments. Appl Nurs Res Feb 1992;5(1):38-43.
216. Daghistani D, Horn M, Rodriguez Z, et al. Prevention of indwelling central venous catheter sepsis. Med Pediatr Oncol Jun 1996;26(6):405-8.
217. Danchaivijitr S, Suthisanon L, Jitreecheue L, et al. Effects of education on the prevention of pressure sores. J Med Assoc Thai Jul 1995;78 Suppl 1:S1-6.
218. Ferguson TBJ. Continuous quality improvement in medicine: validation of a potential role for medical specialty societies. Am Heart Hosp J Fall 2003;1(4):264-72.
219. Garcia de Lucio L, Garcia Lopez FJ, Marin Lopez MT, et al. Training programme in techniques of self-control and communication skills to improve nurses' relationships with relatives of seriously ill patients: a randomized controlled study. J Adv Nurs Aug 2000;32(2):425-31.
220. Griffiths P. Clinical outcomes for nurse-led in-patient care. Nurs Times Feb 28-Mar 5 1996;92(9):40-3.
221. Jerant AF, Azari R, Martinez C, et al. A randomized trial of telenursing to reduce hospitalization for heart failure: patient-centered outcomes and nursing indicators. Home Health Care Serv Q 2003;22(1):1-20.
222. Tranmer JE, Lochhaus-Gerlach J, Lam M. The effect of staff nurse participation in a clinical nursing research project on attitude towards, access to, support of and use of research in the acute care setting. Can J Nurs Leadersh Jan-Feb 2002;15(1):18-26.
223. Tsai SL, Tsai WW, Chai SK, et al. Evaluation of computer-assisted multimedia instruction in intravenous injection. Int J Nurs Stud Feb 2004;41(2):191-8.
224. Zeler KM, McPharlane TJ, Salamonsen RF. Effectiveness of nursing involvement in bedside monitoring and control of coagulation status after cardiac surgery. Am J Crit Care Sep 1992;1(2):70-5.
225. Spetz J. Public policy and nurse staffing: what approach is best? J Nurs Adm Jan 2005;35(1):14-6.
226. White KM. Policy spotlight: staffing plans and ratios. Nurs Manage Apr 2006;37(4):18-22, 4.
227. Rainio AK, Ohinmaa AE. Assessment of nursing management and utilization of nursing resources with the RAFAELA patient classification system--case study from the general wards of one central hospital. J Clin Nurs Jul 2005;14(6):674-84.
228. DeGroot HA. Patient classification systems and staffing. Part 2, Practice and process. J Nurs Adm Oct 1994;24(10):17-23.
229. Dunbar LJ, Diehl BC. Developing a patient classification system for the pediatric rehabilitation setting. Rehabil Nurs Nov-Dec 1995;20(6):328-32.
230. Phillips CY, Castorr A, Prescott PA, et al. Nursing intensity. Going beyond patient classification. J Nurs Adm Apr 1992;22(4):46-52.

List of Acronyms/Abbreviations

AHRQ	Agency for Healthcare Research and Quality
ANA	American Nurses Association
AONE	American Organization of Nurse Executives
BSN	Bachelor of Science in Nursing
CDC	Centers for Disease Control and Prevention
CI	Confidence Interval
CPR	Cardiopulmonary Resuscitation
DHHS	Department of Health and Human Services
DRGs	Diagnosis Related Groups
FTE	Full Time Equivalent
HPD	Hours per Patient Day
ICD-9	International Classification of Diseases (9th revision)
ICU	Intensive Care Unit
IEN	Internationally Educated Nurse
JCAHO	Joint Commission on Accreditation of Healthcare Organizations
LOS	Length of Stay
LPN	Licensed Practical Nurse
LVN	Licensed Vocational Nurse
MOOSE	Meta-analysis Of Observational Studies in Epidemiology
MS	Master of Science
NIOSH	National Institute for Occupational Safety and Health
NQF	National Quality Forum
NS	Not Significant
PhD	Doctor of Philosophy
QOL	Quality of Life
RRT	Rapid Response Team
RN	Registered Nurse
RR	Relative Risk
TEP	Technical Expert Panel
UAP	Unlicensed Assistive Personnel
UTI	Urinary Tract Infection

Nurse Staffing and Quality of Patient Care

Appendixes

Appendix A: Exact Search Strings

Appendix B: List of Excluded Studies

Appendix C: Technical Expert Panel Members and Affiliation

Appendix D: Sample Abstraction Forms

Appendix E: Quality of the Studies

Appendix F. Analytic Framework

Appendix G: Evidence Tables

Appendix A: Exact Search Strings

Search Strategy for Questions 1, 2, and 4

The following data bases were searched:

- Med Line (PubMed)
- CINAHL
- The Cochrane Database of Systematic Reviews
- The Cochrane Central Register of Controlled Trials
- EBSCO Research Database
- BioMed Central
- Government agencies and nurse's associations' websites are searched to identify unpublished reports of the conducted surveys and regulatory documents of nursing hospital staffing:
- United States Department of Health and Human Services
- Agency for Healthcare Research and Quality
- National Database of Nursing Quality Indicators
- National Center for Health Workforce Analysis
- American Nurses Association
- American Academy of Nurse Practitioners
- Government publications.
- Database http://www.marcive.com/webdocs
- Catalog of U.S. Government Publications (U.S. GPO)
- Digital Dissertations
- Internet (www.google.com) with the key words identical MeSH terms
- Manual search of the references in articles to identify eligible studies published before 1990

The following MeSH terms and key words (in databases other than Medline) and their combinations were used to search the data bases from 1990 through June 2006:

"Nurses" [MeSH] (Q 1-4)*
"Nursing staff, hospital" [MeSH] (Q 1-4)
"Nursing administration research" [MeSH] (Q 1-4)
"Nursing audit" [MeSH] (Q 1-2, 4)
"Nursing education research" [MeSH] (Q 1-2, 4)
"Clinical competence" [MeSH] (Q 1-2)
"Health care quality, access, and evaluation" [MeSH] (Q1-2, 4)
"Health services research" [MeSH] (Q1, 2, 4)
"Outcome assessment (health care)" [MeSH] (Q1-2, 4)
"Health care category" [MeSH] (Q1, 2, 4)
"Patients" [MeSH] (Q1-2, 4)
"Length of stay" [MeSH] (Q1-2, 4)
"Patient satisfaction" [MeSH] (Q1-2, 4)

“Hospital units” [MeSH] (Q1, 2, 4)
“Personnel staffing and scheduling” [MeSH] (Q1-3)
“Patient centered care” [MeSH] (Q4)
“Nurse patient relations” [MeSH] (Q1-2, 4)
“Hospital patient relations” [MeSH] (Q1-2, 4)
"Models, nursing” [MeSH] (Q 4)
“Labor unions” [MeSH] (Q 4)
“Malpractice” [MeSH]
“Hospitals” [MeSH] (Q4)
Nurse to patient ratio (keyword) (Q1-3)
“Skill mix” [MeSH] (Q3)
“Part time employment [MeSH] (Q3)
“Foreign nurses [MeSH] (Q3)
“Registry personnel” [MeSH] (Q3)
Overtime (keyword) (Q3)
Flexible scheduling (keyword) (Q3)
Shift work (key word) (Q3)

* The numbers in parentheses refer to the question for which this term was relevant

Search Strategy for Question 3

(Inclusion criteria for all studies: North American hospitals, research in peer reviewed journal, published between 1990-2006)

Shift work staffing policy variable
58 eligible for review
51 excluded:

- 41 Not relevant (not related to variable of interest)
- 1 Integrative review not related to study variable
- 2 Conference abstract
- 2 Nursing home
- 3 Not peer reviewed journal
- 2 Inadequate data presentation

7 included

Overtime staffing policy variable
20 eligible for review
14 excluded:

- 9 Not relevant (not related to variable of interest)
- 1 Inadequate data presentation
- 4 Not peer reviewed journal

6 included

Full and part time staff use variable
28 eligible for review
22 excluded:
- 15 Not relevant (not related to variable of interest)
- 6 Not peer reviewed journal
- 1 Inadequate data presentation

6 included

Foreign educated nurses variable
20 eligible for review
14 excluded
- 12 Not relevant (not related to variable of interest)
- 1 Not research
- 1 Not peer reviewed journal

6 included

Agency/contract nurses variable
21 eligible for review
16 excluded:
- 10 Not relevant (not related to variable of interest)
- 1 Nursing home
- 2 Inadequate data presentation
- 3 Not peer reviewed journal

5 included

Total studies on staffing policy variables
147 eligible for review
117 excluded:
- 87 Not relevant (not related to variable of interest)
- 2 Conference proceedings
- 1 Integrative review not related to variable of interest
- 3 Nursing home
- 17 Not peer reviewed journal
- 6 Inadequate presentation of data
- 1 Not research

30 included

Literature Search Strings

MeSH terms	Studies
The National Library of Medicine via PubMed:	
“Nurses” [MeSH]	51,730
"Nursing staff, hospital"[MeSH]	28,092
"Nursing administration research”[MeSH]	1,218
"Nursing audit"[MeSH]	2,349

MeSH terms	Studies
"Nursing education research"[MeSH]	3,285
"Clinical competence"[MeSH]	33,806
"Health care quality, access, and evaluation"[MeSH]	3,090,640
"Health services research"[MeSH]	64,621
"Outcome assessment (health care)"[MeSH]	286,369
"Health care category"[MeSH]	4,438,573
"Personnel administration, hospital"[MeSH]	4,968
"Patients"[MeSH]	35,872
"Length of stay"[MeSH]	33,382
"Patient satisfaction"[MeSH]	28,736
"Hospital units"[MeSH]	48,491
"United States/epidemiology"[MeSH]	77,520
"Personnel staffing and scheduling"[MeSH]	9,484
"Models, nursing"[MeSH]	7,513
"Foreign professional personnel"[MeSH]	3,523
("Safety management"[MeSH] OR "risk management"[MeSH])	82,840
("Safety management"[MeSH] OR "risk management"[MeSH]) Limits: English, humans	70,596
("Safety management"[MeSH] OR "risk management"[MeSH]) NOT review NOT letters NOT editorials Limits: English, humans	48,105
"Nurses"[MeSH] NOT review NOT letters NOT editorials	43,370
"Nursing staff, hospital"[MeSH] NOT review NOT letters NOT editorials	25,773
"Nursing administration research "[MeSH] NOT review NOT letters NOT editorials	994
"Nursing audit"[MeSH] NOT review NOT letters NOT editorials Limits: English, humans	1,450
"Nursing education research "[MeSH] NOT review NOT letters NOT editorials Limits: humans	2,723
"Clinical competence"[MeSH] NOT review NOT letters NOT editorials Limits: humans	22,181
"Health care quality, access, and evaluation"[MeSH] NOT review NOT letters NOT editorials Limits: English, humans	1,798,295
"Health services research"[MeSH] NOT review NOT letters NOT editorials Limits: humans	43,486
"Outcome assessment (health care)"[MeSH] AND "health services research" [MeSH] NOT review NOT letters NOT editorials Limits: humans	15
"Health care category"[MeSH] NOT review NOT letters NOT editorials Limits: English, humans	2,320,378
"Personnel administration, hospital"[MeSH] NOT review NOT letters NOT editorials Limits: English, humans	1,601
"Patients"[MeSH] NOT review NOT letters NOT editorials Limits: English, humans	23,507
"Length of stay"[MeSH] NOT review NOT letters NOT editorials Limits: English, humans	22,937

MeSH terms	Studies
"Patient satisfaction"[MeSH] NOT review NOT letters NOT editorials Limits: English, humans	20,849
"Hospital units"[MeSH] NOT review NOT letters NOT editorials Limits: English, humans	27,731
"United States/epidemiology"[MeSH] NOT review NOT letters NOT editorials Limits: English, humans	57,481
"Personnel staffing and scheduling"[MeSH] NOT review NOT letters NOT editorials Limits: English, humans	5,335
"Models, nursing"[MeSH] NOT review NOT letters NOT editorials Limits: English, humans	4,544
"Foreign professional personnel"[MeSH] NOT review NOT letters NOT editorials Limits: English, humans	1,375
"Nurses"[MeSH] NOT review NOT letters NOT editorials AND "patients"[MeSH] Limits: English, humans	396
"Nurses"[MeSH] NOT review NOT letters NOT editorials AND "clinical competence" Limits: English, humans	6
"Nurses"[MeSH] NOT review NOT letters NOT editorials AND "health care quality, access, and evaluation"[MeSH] Limits: English, humans	49
"Nurses"[MeSH] NOT review NOT letters NOT editorials AND "health services research" Limits: English, humans	2
"Nurses"[MeSH] NOT review NOT letters NOT editorials AND "outcome assessment (health care)" Limits: English, humans	1
"Nurses"[MeSH] NOT review NOT letters NOT editorials AND "personnel administration, hospital" Limits: English, humans	0
"Nurses"[MeSH] NOT review NOT letters NOT editorials AND "length of stay" Limits: English, humans	2
"Nurses"[MeSH] NOT review NOT letters NOT editorials AND "patient satisfaction" Limits: English, humans	2
"Nurses"[MeSH] NOT review NOT letters NOT editorials AND personnel staffing and scheduling Limits: English, humans	2
"Epidemiologic studies"[MeSH] Limits: English, humans	728,060
"Epidemiologic studies"[MeSH] AND "nurses"[MeSH] Limits: English, humans	1,210
"Epidemiologic studies"[MeSH] AND "nursing staff, hospital"[MeSH] Limits: English, humans	731
"Epidemiologic studies"[MeSH] AND "nursing administration research "[MeSH] Limits: English, humans	99
"Epidemiologic studies"[MeSH] AND "nursing audit"[MeSH] Limits: English, humans	210
"Epidemiologic studies"[MeSH] AND "nursing education research "[MeSH] Limits: English, humans	187
"Epidemiologic studies"[MeSH] AND "clinical competence"[MeSH] Limits: English, humans	2,169
"Epidemiologic studies"[MeSH] AND "health care quality, access, and evaluation"[MeSH] Limits: English, humans	728,210

MeSH terms	Studies
"Epidemiologic studies"[MeSH] AND "health services research "[MeSH] AND "nurses"[MeSH] Limits: English, humans	85
"Epidemiologic studies"[MeSH] AND "nurses"[MeSH] AND "outcome assessment (health care)"[MeSH] Limits: English, humans	108
"Epidemiologic studies"[MeSH] AND "nurses"[MeSH] AND "personnel administration, hospital" [MeSH] Limits: English, humans	0
"Epidemiologic studies"[MeSH] AND "nurses"[MeSH] AND "patients" [MeSH] Limits: English, humans	23
"Epidemiologic studies"[MeSH] AND "nurses"[MeSH] AND "length of stay"[MeSH] Limits: English, humans	38
"Epidemiologic studies"[MeSH] AND "nurses"[MeSH] AND "patient satisfaction"[MeSH] Limits: English, humans	56
"Epidemiologic studies"[MeSH] AND "models, nursing" Limits: English, humans	190
"Epidemiologic studies"[MeSH] AND "nursing staff, hospital"[MeSH] AND "safety management" Limits: English, humans	1
"Nursing staff, hospital"[MeSH] AND "patients"[MeSH] Limits: English, humans	506
"Nursing staff, hospital"[MeSH] AND "length of stay"[MeSH] Limits: English, humans	192
"Nursing staff, hospital"[MeSH] AND "patient satisfaction"[MeSH] Limits: English, humans	324
"Nursing staff, hospital"[MeSH] AND "safety management"[MeSH] Limits: English, humans	188
"Safety management"[MeSH] AND "nursing administration research "[MeSH] Limits: English, humans	17
"Safety management"[MeSH] AND "nursing audit"[MeSH] Limits: English, humans	18
"Safety management"[MeSH] AND "clinical competence"[MeSH] Limits: English, humans	125
"Safety management"[MeSH] AND "health dare quality, access, and evaluation"[MeSH] Limits: English, humans	3,253
"Safety management"[MeSH] AND "health services research"[MeSH] Limits: English, humans	465
"Safety management"[MeSH] AND "outcome assessment (health care)"[MeSH] Limits: English, humans	111
"Safety management"[MeSH] AND "models, nursing" Limits: English, humans	27
"Outcome assessment (health care)"[MeSH] AND "nursing staff, hospital"[MeSH] Limits: English, humans	344
CINAHL - Cumulative Index to Nursing & Allied Health Literature:	
“Personnel staffing and scheduling"	9,271
“Nursing staff, hospital/manpower”	57
"Length of stay"	5,269
“Patient safety”	14,395

MeSH terms	Studies
"Nurses"	72,321
"Personnel staffing and scheduling" or "nursing staff, hospital/manpower" AND "length of stay" or "patient safety"	1,025
"Personnel staffing and scheduling" or "nursing staff, hospital/manpower" AND "length of stay" or "patient safety" limit on English, NOT review or letter	86
The Cochrane Library:	
"Nursing staff, hospital" and "outcome assessment (health care)"	0
"Nurse" AND "patient"	4
BioMed Central :	
"Nursing staff, hospital" AND "patient safety"	0
"Nursing staff, hospital" AND "patient outcomes"	0
Nursing staff, hospital AND health services research	287
Nursing staff, hospital AND adverse events	79
Google scholar: "nursing staff, hospital" AND "patient outcomes" NOT long-term care, published after 1990	1,700
Catalog of U.S. Government Publications (U.S. GPO):	
Nursing Staff, Hospital	9
LexisNexis™ Government Periodicals Index:	
"Nurses and nursing" AND "Hospitals"	25
Digital Dissertations:	
Nurse AND patient	1,863
Nursing staff, hospital	0
Nurse AND staffing AND hospital AND patient	20
Agency of Health Care Research and Quality:	
Nurse staffing and Patient	893

Positive Likelihood of MeSH Terms and Keywords (*) to Identify Studies Eligible for Questions 1, 2, and 4

Algorithm:

Sensitivity = TP/(TP+FN)
Specificity = TN/(FP+TN)
Positive Likelihood = SENS/(1-SPEC)
Negative Likelihood = (1-SENS)/SPEC

Study status	Eligible	Excluded	Total
Keyword Present	TP	FP	
Keyword absent	FN	TN	
	96	2,762	2,858

A. Highest Positive Predictive Likelihood

MeSH terms and keywords	Sensitivity, %	Specificity, %	Positive Likelihood
*Burnout professional	3.13	99.96	86.31
Decubitus ulcer/epidemiology	6.25	99.93	86.31
Nurses/*supply & distribution	3.13	99.96	86.31
United States Centers for Medicare and Medicaid Services	5.21	99.93	71.93
Accidental falls s & numerical data	9.38	99.86	64.73
*Mortality	2.08	99.96	57.54
Comorbidity	2.08	99.96	57.54
Medicare/*statistics & numerical data	2.08	99.96	57.54
Nursing service	2.08	99.96	57.54
Urinary tract infection	2.08	99.96	57.54
California/epidemiology	5.21	99.89	47.95
Health services research/methods	3.13	99.93	43.16
*Anesthesiology	1.04	99.96	28.77
*Economic competition	1.04	99.96	28.77
*Economics	1.04	99.96	28.77
*Outcome and process assessment (health care)	5.21	99.82	28.77
Acquired immunodeficiency syndrome	1.04	99.96	28.77
Bacteremia/epidemiology	1.04	99.96	28.77
Bacteremia/epidemiology/etiology	1.04	99.96	28.77
Burn units/*manpower	1.04	99.96	28.77
Contract services/organization & administration	1.04	99.96	28.77
Cross infection/*prevention & control	2.08	99.93	28.77
Cross infection/epidemiology	1.04	99.96	28.77
Cross infection/epidemiology/*etiology/ prevention & control	1.04	99.96	28.77
Delivery of health care/*organization & administration	1.04	99.96	28.77
Disease outbreak	1.04	99.96	28.77
Economics hospital	1.04	99.96	28.77
Education nursing	1.04	99.96	28.77
Health maintenance organizations	1.04	99.96	28.77
Health maintenance organizations *organization & administration	1.04	99.96	28.77
Hospital restructuring	1.04	99.96	28.77
Hospitals pediatric	1.04	99.96	28.77
Hospitals university	1.04	99.96	28.77
Hospitals urban	1.04	99.96	28.77
Hospitals/*standards	1.04	99.96	28.77
Hospitals/classification	1.04	99.96	28.77
Hospitals/*standards/statistics & numerical data	1.04	99.96	28.77
Iatrogenic disease	1.04	99.96	28.77
Insurance claim	1.04	99.96	28.77

MeSH terms and keywords	Sensitivity, %	Specificity, %	Positive Likelihood
Intensive care units neonatal/economics	1.04	99.96	28.77
Intensive care units pediatric/*organization & administration	1.04	99.96	28.77
Medicare	2.08	99.93	28.77
Nurses' aides/supply & distribution	2.08	99.93	28.77
Nursing staff hospital/*economics/organization & administration	1.04	99.96	28.77
Nursing staff hospital/*education/*standards	1.04	99.96	28.77
Nursing staff hospital/organization & administration/statistics	1.04	99.96	28.77
Outcome assessment	1.04	99.96	28.77
Pediatrics	1.04	99.96	28.77
Pennsylvania/epidemiology	1.04	99.96	28.77
Personnel management	1.04	99.96	28.77
Pneumonia/epidemiology	1.04	99.96	28.77
Postoperative complications/epidemiology	1.04	99.96	28.77
Quality of health care	1.04	99.96	28.77
Quality of health care/*classification	1.04	99.96	28.77
Restraint physical	1.04	99.96	28.77
Safety management	1.04	99.96	28.77
Surgical procedures operative/*statistics & numerical data	1.04	99.96	28.77
United States Agency for Healthcare Research and Quality	1.04	99.96	28.77
Urinary tract infections/epidemiology/etiology	1.04	99.96	28.77
Workload/ psychology	2.08	99.93	28.77
Workload/standards	2.08	99.93	28.77
*Hospital mortality	13.54	99.49	26.72
Cross Infection/epidemiology	3.13	99.86	21.58
Medication error	6.25	99.71	21.58
Iatrogenic disease	2.08	99.89	19.18
Morbidity	2.08	99.89	19.18
Nursing care/psychology	2.08	99.89	19.18
Probability	2.08	99.89	19.18
Odds ratio	5.21	99.67	15.98
United States/epidemiology	14.58	99.02	14.92
*Educational standards	1.04	99.93	14.39
*Treatment outcome	1.04	99.93	14.39
Catheterization	1.04	99.93	14.39
Databases factual	1.04	99.93	14.39
Diagnosis related groups/statistics & numerical data	1.04	99.93	14.39
Education nursing baccalaureate	2.08	99.86	14.39

MeSH terms and keywords	Sensitivity, %	Specificity, %	Positive Likelihood
Hospital units/*organization & administration/ standards	1.04	99.93	14.39
Hospitals public	1.04	99.93	14.39
Hospitals teaching	1.04	99.93	14.39
Length of stay/epidemiology	1.04	99.93	14.39
Maryland	2.08	99.86	14.39
Matched-pair analysis	1.04	99.93	14.39
Minnesota/epidemiology	1.04	99.93	14.39
Nursing service	2.08	99.86	14.39
Nursing staff hospital	1.04	99.93	14.39
Patient isolation	1.04	99.93	14.39
Personnel hospital	1.04	99.93	14.39
Referral and con	1.04	99.93	14.39
Sentinel surveillance	1.04	99.93	14.39
Workload/psychology	1.04	99.93	14.39
*Outcome assessment (health care)	15.63	98.84	13.49
Nurses' aides/*	2.08	99.82	11.51
*Education nursing	1.04	99.89	9.59
Nursing staff hospital/*organization & administration/standards	1.04	99.89	9.59
Accidental falls	1.04	99.89	9.59
Chronic disease	2.08	99.78	9.59
Health services research/*method	1.04	99.89	9.59
Hospital costs/*statistics & numerical data	1.04	99.89	9.59
Hospital restructuring	1.04	99.89	9.59
Hospitals teaching/standards	1.04	99.89	9.59
Hospitals teaching/statistics & numerical data	1.04	99.89	9.59
Mortality	1.04	99.89	9.59
Nursing assessment/organization & administration	1.04	99.89	9.59
Nursing staff hospital/*organization & administration/*standard	1.04	99.89	9.59
Nursing staff hospital/economic/psychology/* supply & distribution	1.04	99.89	9.59
Ontario/epidemiology	1.04	99.89	9.59
Patient discharge	1.04	99.89	9.59
Personnel staffing and scheduling/*legislation & jurisprudence/*standards	1.04	99.89	9.59
Personnel staffing and scheduling/*standards/ statistics & numerical data	1.04	99.89	9.59
Poisson distribution	1.04	99.89	9.59
Psychology industrial	1.04	99.89	9.59
Quality of health care/standards	1.04	99.89	9.59
Risk adjustment	1.04	99.89	9.59

MeSH terms and keywords	Sensitivity, %	Specificity, %	Positive Likelihood
Statistics	1.04	99.89	9.59
Personnel staffing and scheduling/*statistics & numerical data	5.21	99.46	9.59
Multivariate analysis	9.38	98.95	8.93
Diagnosis related	3.13	99.64	8.63
*Quality indicators, health care	5.21	99.38	8.46
Logistic models	9.38	98.84	8.09
Pennsylvania	4.17	99.46	7.67
Hospital mortality	7.29	99.02	7.46
Continuity of patient care/standards	1.04	99.86	7.19
Medication error	1.04	99.86	7.19
Models theoretical	1.04	99.86	7.19
Outcome and process assessment (health care)/*organization &	1.04	99.86	7.19
Ownership	1.04	99.86	7.19
Patient education	1.04	99.86	7.19
Patient readmission	1.04	99.86	7.19
Personnel staffing and scheduling/economics/* standards	1.04	99.86	7.19
Personnel staffing and scheduling/statistics & numerical data/*trends	1.04	99.86	7.19
Risk	1.04	99.86	7.19
Administration/utilization	1.04	99.86	7.19
Acute disease/nursing	3.13	99.57	7.19
Linear models	3.13	99.53	6.64
Research support	23.96	96.16	6.24
Research support	4.17	99.31	6.06
*Licensure nursing	1.04	99.82	5.75
American Hospital Association	1.04	99.82	5.75
Confidence intervals	1.04	99.82	5.75
Feasibility studies	1.04	99.82	5.75
Hospital bed capacity	1.04	99.82	5.75
Least-squares analysis	1.04	99.82	5.75
Likelihood function	1.04	99.82	5.75
Medical staff hospital/statistics & numerical data	1.04	99.82	5.75
Nurses	1.04	99.82	5.75
Nursing staff hospital/*standards/supply & distribution	1.04	99.82	5.75
Population surveillance	1.04	99.82	5.75
Postoperative care	1.04	99.82	5.75
Proportional hazard	1.04	99.82	5.75
Salaries and fringes	1.04	99.82	5.75
Tennessee	1.04	99.82	5.75
Health care survey	6.25	98.91	5.75

MeSH terms and keywords	Sensitivity, %	Specificity, %	Positive Likelihood
Benchmarking	4.17	99.28	5.75
Case-control study	4.17	99.24	5.48
Outcome and process assessment (health care)	3.13	99.42	5.39
Sampling studies	2.08	99.60	5.23
Workload/*statistics	2.08	99.60	5.23
Midwestern United States	3.13	99.38	5.08
Health services	10.42	97.94	5.05

B. MeSH Terms and Keywords in Eligible Studies (Sensitivity >0)

MeSH terms	Sensitivity	Specificity	Positive Predictive Likelihood
*Models statistics	1.04	99.78	4.80
Alberta	1.04	99.78	4.80
Critical pathway	1.04	99.78	4.80
District of Columbia	1.04	99.78	4.80
Nursing staff hospital/*legislation & jurisprudence/*supply &	1.04	99.78	4.80
Patient care planning	1.04	99.78	4.80
Patients	1.04	99.78	4.80
Length of stay	10.42	97.79	4.72
Regression analysis	9.38	97.97	4.62
Intensive care units	4.17	99.09	4.60
Length of stay/standards	5.21	98.84	4.50
Quality indicators health care	4.17	99.06	4.43
Hospital bed capacity	2.08	99.53	4.43
Length of stay/economics	2.08	99.53	4.43
Cohort studies	3.13	99.28	4.32
*Patients	1.04	99.75	4.11
Bed occupancy	1.04	99.75	4.11
Consumer satisfaction	1.04	99.75	4.11
Hospital costs/standards	1.04	99.75	4.11
Hospital-patient relations	1.04	99.75	4.11
Hospitalization	1.04	99.75	4.11
Intensive care units/*organization & administration	1.04	99.75	4.11
Medical errors	1.04	99.75	4.11
Patient satisfaction	1.04	99.75	4.11
Southeastern union	1.04	99.75	4.11
Nursing supervisory	2.08	99.49	4.11
American Nurses' Association	2.08	99.46	3.84
Personnel turnover	2.08	99.46	3.84
Outcome assessment (health care)	9.38	97.54	3.81
*Length of stay	1.04	99.71	3.60

MeSH terms	Sensitivity	Specificity	Positive Predictive Likelihood
*Models organizational	1.04	99.71	3.60
Choice behavior	1.04	99.71	3.60
Forms and records	1.04	99.71	3.60
Nurses' aides/*organization & administration	1.04	99.71	3.60
Safety	2.08	99.42	3.60
Risk assessment	2.08	99.38	3.38
*Patient care team	1.04	99.67	3.20
Education nursing	1.04	99.67	3.20
Hospital bed cap	1.04	99.67	3.20
Hospitals public	1.04	99.67	3.20
Medical staff hospital/standard	1.04	99.67	3.20
Missouri	1.04	99.67	3.20
Nursing staff hospital/education*organization	1.04	99.67	3.20
Physician-nurse relations	1.04	99.67	3.20
Hospital restructuring/*organization & administration	2.08	99.35	3.20
Patient satisfaction/*statistics & numerical data	2.08	99.35	3.20
Predictive value	3.13	98.99	3.08
Risk factors	15.63	94.71	2.96
*Intensive care	1.04	99.64	2.88
*Personnel staff	1.04	99.64	2.88
Health policy	1.04	99.64	2.88
Nursing care/*organization	1.04	99.64	2.88
Nursing service	1.04	99.64	2.88
Safety management	1.04	99.64	2.88
Administration/standards	1.04	99.64	2.88
*Quality of health care	10.42	96.16	2.71
Quality of health care	8.33	96.92	2.71
Nursing administration research	14.58	94.61	2.70
Severity of illness	4.17	98.44	2.68
*Efficiency organization	1.04	99.60	2.62
Hospitals/*standards	1.04	99.60	2.62
Length of stay/*statistics & numerical data	1.04	99.60	2.62
Stress psychological	1.04	99.60	2.62
Personnel staffing and scheduling/standards	3.13	98.77	2.54
Personnel turnover	3.13	98.73	2.47
Acute disease	2.08	99.13	2.40
*Clinical competition	3.13	98.70	2.40
Clinical nursing	1.04	99.57	2.40
Connecticut	1.04	99.57	2.40
Night care/*manpower	1.04	99.57	2.40
Nursing staff hospital/psychology/supply & distribution	1.04	99.57	2.40

MeSH terms	Sensitivity	Specificity	Positive Predictive Likelihood
Numerical data	2.08	99.09	2.30
Nursing care/*standards	3.13	98.62	2.27
*Quality assurance health care	1.04	99.53	2.21
Absenteeism	1.04	99.53	2.21
Nursing staff hospital/organization & administration	1.04	99.53	2.21
Pain measurement	1.04	99.53	2.21
Case management	1.04	99.49	2.06
Nursing care/statistics	1.04	99.49	2.06
Outcome assessment	1.04	99.49	2.06
Nursing staff hospital/economic	2.08	98.91	1.92
Internal-external control	1.04	99.46	1.92
Organizational case studies	1.04	99.46	1.92
Prevalence	2.08	98.88	1.86
*Nursing staff	1.04	99.42	1.80
Total quality management	1.04	99.42	1.80
Treatment outcome	2.08	98.81	1.74
Costs and cost assessment	1.04	99.38	1.69
Patient discharge	1.04	99.38	1.69
Health services	2.08	98.73	1.64
Models organizational	2.08	98.73	1.64
Ontario	2.08	98.73	1.64
*Personnel management	1.04	99.35	1.60
Nursing research	1.04	99.35	1.60
Nursing staff hospital/*supply distribution	16.67	89.54	1.59
Aged	14.58	90.55	1.54
Pilot projects	4.17	97.28	1.53
Personnel staffing and scheduling/*standards	7.29	95.22	1.53
*Occupational health	1.04	99.31	1.51
Evidence-based	1.04	99.31	1.51
Hospital costs	1.04	99.31	1.51
Statistics nonparametric	1.04	99.31	1.51
Incidence	2.08	98.59	1.48
*Professional autonomy	1.04	99.28	1.44
Hospital bed capacity	1.04	99.28	1.44
Hospital units	1.04	99.28	1.44
Research support	23.96	83.09	1.42
*Leadership	1.04	99.24	1.37
Educational status	1.04	99.24	1.37
Distribution	3.13	97.68	1.35
Retrospective studies	5.21	96.13	1.34
Risk management	1.04	99.20	1.31
Administration	1.04	99.20	1.31

MeSH terms	Sensitivity	Specificity	Positive Predictive Likelihood
Prospective studies	7.29	94.28	1.27
California	3.13	97.54	1.27
Workload	7.29	94.24	1.27
*Decision making	1.04	99.17	1.25
Analysis of variance	3.13	97.50	1.25
Data	1.04	99.17	1.25
Michigan	1.04	99.13	1.20
Longitudinal studies	3.13	97.36	1.18
Nurse-patient relations	4.17	96.45	1.17
Organizational innovation	4.17	96.45	1.17
Age 80 and over	4.17	96.38	1.15
Male	25.00	78.17	1.15
Job satisfaction	6.25	94.42	1.12
Quality assurance	1.04	99.06	1.11
administration/psychology	1.04	99.06	1.11
Patient satisfaction	6.25	94.32	1.10
United States	15.63	85.37	1.07
Cross-sectional	7.29	93.16	1.07
Cost control	1.04	98.99	1.03
Patient care team	1.04	98.99	1.03
Time factors	4.17	95.87	1.01
Factor analysis	1.04	98.95	0.99
Power (psychology)	1.04	98.95	0.99
*Patient satisfaction	4.17	95.80	0.99
Canada	1.04	98.91	0.96
Nursing evaluation on research	6.25	93.41	0.95
Middle age	14.58	84.43	0.94
Nurse administrators	1.04	98.88	0.93
Texas	1.04	98.88	0.93
Female	25.00	72.88	0.92
Evaluation studies	1.04	98.84	0.90
Personnel staffing and scheduling	7.29	91.64	0.87
Child	4.17	95.22	0.87
Data collection	2.08	97.57	0.86
*Job satisfaction	3.13	96.31	0.85
*Inpatients	1.04	98.77	0.85
*Personnel staff	7.29	91.24	0.83
Cost-benefit	1.04	98.62	0.76
Humans	71.88	2.75	0.74
Efficiency organization	1.04	98.59	0.74
Comparative study	6.25	90.84	0.68
Adult	14.58	77.62	0.65
Infant	1.04	98.37	0.64

MeSH terms	Sensitivity	Specificity	Positive Predictive Likelihood
Medical staff hospital	1.04	98.33	0.63
Nursing audit	1.04	98.30	0.61
Attitude of health	5.21	91.31	0.60
Child preschool	1.04	98.23	0.59
Inpatients/*psychology	1.04	98.19	0.58
Job description	1.04	98.12	0.55
Organizational care	2.08	96.20	0.55
Professional autonomy	1.04	98.04	0.53
Reproducibility	1.04	98.04	0.53
Adolescent	2.08	96.05	0.53
Hospitals teach	1.04	97.97	0.51
*Nursing staff hospital	4.17	91.67	0.50
Nurse's role	2.08	95.58	0.47
*Nurse's role	1.04	97.72	0.46
Personnel staffing and scheduling/*organization & administration	3.13	93.12	0.45
Personnel staffing and scheduling/*legislation & jurisprudence	1.04	97.61	0.44
Social support	1.04	97.61	0.44
Clinical competence	1.04	97.57	0.43
*Models nursing	2.08	95.11	0.43
Clinical compete	1.04	97.47	0.41
Questionnaires	6.25	82.48	0.36
Infant newborn	1.04	97.07	0.36
Interprofessional relations	1.04	96.85	0.33
Needs assessment	1.04	96.02	0.26
Models nursing	1.04	95.37	0.22

C. MeSH Terms and Keywords in Excluded Studies (Sensitivity = 0)

MeSH Terms

*Absenteeism
*Accidental fall
*Accidental falls/economics
*Accidents
*Accidents occupational
*Accidents occupational/prevention & control/statistics & numerical data
*Accreditation
*Aftercare/statistics & numerical data
*Allied health personnel
*American Nurses Association
*Ancillary services hospital/statistics & numerical data
*Automatic data processing

*Automation
*Bed occupancy
*Bed occupancy/economics
*Benchmarking
*Bereavement
*Burnout professional/epidemiology/etiology/psychology
*Burnout professional/etiology/prevention & control
*Burnout professional/etiology/ prevention & control/psychology
*Burnout professional/prevention & control/psychology
*Caregivers
*Case management
*Cause of death
*Clinical nursing research
*Clinical protocols
*Communication
*Communication barriers
*Consumer satisfaction
*Continuity of patient care
*Contract services
*Contract services/economics
*Cost of illness
*Cost-benefit analysis
*Counseling/education/standards
*Credentialing
*Cross infection
*Cross infection/nursing/transmission/virology
*Cross-cultural comparison
*Data collection
*Data interpretation statistical
*Death
*Decision making
*Decision support
*Decision support systems management
*Decision support techniques
*Decision trees
*Delivery of health care
*Diagnosis-related groups
*Diagnostic errors
*Disease transmission professional-to-patient
*Documentation
*Drug combinations
*Drug compounding
*Drug delivery systems
*Drug labeling
*Drug therapy computer-assisted
*Economics hospital

*Economics nursing
*Education medical continuing
*Education nursing baccalaureate
*Education nursing continuing
*Educational measurement
*Efficiency
*Emergency medicine/organization & administration*emergency nursing
*Emergency nursing/organization & administration
*Emergency service hospital
*Emergency service hospital/organization & administration
*Employee discipline
*Employee incentive plans
*Employee performance appraisal
*Employment
*Episode of care
*Ethics
*Ethics business
*Ethics clinical
*Ethics institutional
*Ethics nursing
*Evidence-based medicine
*Expert testimony/*legislation & jurisprudence
*Foreign professional personnel
*Foreign professional personnel/education/psychology
*Foreign professional personnel/standards
*Health care rationing
*Health care reform
*Health care surveys
*Health education
*Health education/methods
*Health facility closure
*Health facility environment
*Health facility environment/ethics/organization & administration*health facility merger
*Health knowledge attitudes practice
*Health manpower
*Health services accessibility
*Health services needs and demand
*Health services statistics & numerical data
*Health services research
*Hospital administration
*Hospital communication systems/organization & administration
*Hospital costs
*Hospital design and construction*hospital information systems
*Hospital information systems/organization & administration
*Hospital restructuring
*Hospital units

*Hospital-patient relations
*Hospitalization
*Hospitalization/economics
*Hospitalization/statistics & numerical data
*Hospitals
*Infection control practitioners
*Inpatients/education/psychology
*Inpatients/psychology
*Inpatients/psychology/statistics & numerical data
*Intensive care units/manpower
*Intensive care units/statistics
*Interpersonal relations
*Inter professional relations
*Joint Commission on Accreditation of Healthcare Organizations
*Labor unions
*Labor unions/trends
*Legislation hospital
*Legislation nursing
*Length of stay/legislation & jurisprudence/statistics & numerical data
*Liability legal
*Linear models
*Malpractice
*Medical errors/adverse effects
*Medical staff hospital
*Medical staff hospital/education/psychology
*Medical staff hospital/psychology/statistics & numerical data
*Medication errors/adverse effects
*Medication errors/classification
*Medication errors/methods/nursing/prevention & control/statistics &
*Medication errors/statistics & numerical data
*Models nursing
*Models organizational
*Monitoring intra operative/methods/nursing
*Nurse administrators
*Nurse administrators/education/psychology
*Nurse administrators/organization & administration/psychology
*Nurse practitioners
*Nurse practitioners/economics
*Nurse's role/psychology
*Nurse-patient relations
*Nurseries hospital
*Nurses
*Nurses' aides
*Nurses' aides/education
*Nurses' aides/education/organization & administration/psychology*nursing
*Nursing administration research

*Nursing assessment
*Nursing assessment/methods/standards
*Nursing audit
*Nursing care
*Nursing care/manpower
*Nursing care/organization & administration/psychology
*Nursing care/psychology/standards
*Nursing care/psychology/statistics & numerical data
*Nursing diagnosis
*Nursing methodology research
*Nursing process
*Nursing process/standards
*Nursing records
*Nursing research
*Nursing service hospital
*Nursing staff
*Nursing staff hospital
*Nursing staff hospital/economics/standards
*Nursing staff hospital/economics statistics & numerical data
*Nursing staff hospital/economics/supply & distribution
*Nursing staff hospital/education
*Nursing staff hospital/education/organization
*Nursing staff hospital/education/organization & administration
*Nursing staff hospital/education/psychology
*Nursing staff hospital/education/psychology/supply & distribution
*Nursing staff hospital/education/standards
*Nursing staff hospital/education/supply & distribution
*Nursing staff hospital/legislation & jurisprudence/supply & distribution
*Nursing staff hospital/organization & administration/standards
*Nursing staff hospital/organization & administration/statistics &
*Nursing staff hospital/organization & administration/supply &
*Nursing staff hospital/psychology
*Nursing staff hospital/psychology/standards
*Nursing staff hospital/psychology/statistics & numerical data
*Nursing staff hospital/psychology/supply & distribution
*Nursing staff hospital/statistics & numerical data
*Nursing staff hospital/supply & distribution
*Nursing staff hospital/utilization
*Nursing staff/education/organization & administration/psychology
*Nursing theory
*Nursing practice
*Nursing supervisory
*Nursing team
*Nutrition assessment
*Nutrition/education
*Outcome assessment (health care)/economics (health care)

*Outcome and process assessment (health care)/methods
*Outcome and process assessment (health care)/statistics & numerical data
*Personnel administration hospital
*Personnel management/*methods
*Personnel selection
*Personnel selection/*organization & administration
*Personnel selection/trends
*Personnel staffing and scheduling/*legislation & jurisprudence
*Personnel staffing and scheduling/ economics/legislation &
*Personnel staffing and scheduling/legislation & jurisprudence
*Personnel staffing and scheduling/organization
*Personnel staffing and scheduling/organization & administration
*Personnel staffing and scheduling/standards
*Personnel staffing and scheduling/statistics & numerical data
*Personnel turnover
*Personnel turnover/statistics & numerical data
*Personnel turnover/statistics & numerical data/ trends
*Professional-patient relations
*Program development
*Program evaluation
*Programmed instruction/standards
*Progressive patient care
*Qualitative research
*Quality indicators health care/standards
*Quality of health care/legislation & jurisprudence
*Quality of health care/legislation & jurisprudence/statistics & numerical
*Quality of life
*Restraint physical
*Restraint physical/adverse effects
*Resuscitation
*Risk assessment
*Risk management
*Risk management/methods/organization & administration
*Safety
*Safety management
*Salaries and fringe benefits
*Staff development
*Staff development/methods
*Total quality management
*Work schedule tolerance
*Work schedule tolerance/psychology
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*Workload/economics
*Workload/psychology
*Workload/statistics & numerical data
*Workplace

*Workplace/organization & administration/psychology
*Workplace/psychology
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Academic medical centers/*organization & administration
Academic medical centers/*organization & administration/*statistics &
Academic medical centers/economics/*manpower/organization & administration
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Accidental falls/*prevention & control
Accidental falls/* statistics & numerical data
Accidental falls/economics/statistics & numerical data
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Accidental falls/prevention & control/*statistic/prevention & control/*statistics & numerical data
Accidental falls/prevention & control/*statistic/*statistics & numerical data
Accidents occupational/*prevention & control
Accidents occupational/*statistics & numerical data
Accidents occupational/economics/*prevention & control/statistics
Accidents occupational/economics/prevention & control/*statistics
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Adverse drug reaction reporting systems/*statistics & numerical data
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Allied health personnel/*utilization
Allied health personnel/economics/statistics & numerical data
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American Nurses' Association/organization & administration
Analgesia/*nursing

Analgesia/methods/*nursing
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Burnout professional/*diagnosis/*psychology
Burnout professional/*epidemiology/*psychology
Burnout professional/*epidemiology
Burnout professional/*etiology
Burnout professional/*etiology/psychology
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Burnout professional/*prevention & control
Burnout professional/*prevention & control/*psychology
Burnout professional/*prevention & control/psychology
Burnout professional/*psychology
Burnout professional/classification/diagnosis/etiology/*prevention
Burnout professional/complications/*epidemiology
Burnout professional/diagnosis/*epidemiology/prevention &
Burnout professional/diagnosis/*epidemiology/psychology
Burnout professional/diagnosis/epidemiology/*psychology
Burnout professional/diagnosis/epidemiology/psychology
Burnout professional/diagnosis/etiology/*prevention & control
Burnout professional/diagnosis/etiology/prevention & control/*psychology
Burnout professional/diagnosis/physiopathology/*prevention &
Burnout professional/epidemiology
Burnout professional/epidemiology/*etiology
Burnout professional/epidemiology/etiology/*psychology
Burnout professional/epidemiology/etiology/prevention &
Burnout professional/epidemiology/etiology/psychology
Burnout professional/epidemiology/psychology
Burnout professional/etiology/prevention & control
Burnout professional/etiology/prevention & control/psychology
Burnout professional/etiology/psychology
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Burnout professional/prevention & control/psychology
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Cardiac surgical procedures/*adverse effects/*nursing
Cardiac surgical procedures/*nursing
Cardiac surgical procedures/*nursing/standards
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Cardiopulmonary resuscitation/education/*nursing
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Clinical nursing research/*methods
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Collective bargaining/*legislation & jurisprudence
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Confusion/*nursing/psychology
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Continuity of patient care/*organization & administration
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Critical pathway/*standards
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Cross infection/*epidemiology/transmission
Cross infection/*microbiology
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Cross infection/economics/*epidemiology/*etiology/prevention & control
Cross infection/epidemiology/*microbiology/*transmission

Cross infection/epidemiology/*microbiology/prevention &
Cross infection/epidemiology/*microbiology/transmission
Cross infection/epidemiology/*prevention & control
Cross infection/epidemiology/*prevention & control/virology
Cross infection/epidemiology/etiology/*prevention & control
Cross infection/epidemiology/microbiology/*prevention &
Cross infection/epidemiology/microbiology/*transmission
Cross infection/etiology
Cross infection/etiology/*prevention & control
Cross infection/microbiology/*prevention &
Cross infection/microbiology/*prevention & control/transmission
Cross infection/mortality/*prevention & control
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Data collection/*methods/*standards
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Data collection/*methods/standards/*statistics & numerical data
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Decision making
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Decubitus ulcer/*economics/epidemiology/*therapy
Decubitus ulcer/*epidemiology/*prevention & control
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Decubitus ulcer/*etiology/nursing/*prevention & control
Decubitus ulcer/*nursing
Decubitus ulcer/*nursing/*psychology
Decubitus ulcer/*prevention & control
Decubitus ulcer/economics/ epidemiology/*prevention & control
Decubitus ulcer/epidemiology/etiology
Decubitus ulcer/epidemiology/etiology/*prevention & control
Decubitus ulcer/etiology
Decubitus ulcers/prevention & control
Decubitus ulcer/etiology/*prevention & control
Decubitus ulcer/nursing/*prevention & control
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Delivery of health care integrated
Delivery of health care integrated/*manpower
Delivery of health care integrated/*organization & administration
Delivery of health care integrated/*standards

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Delivery of health care/*economics
Delivery of health care/*history
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Delivery of health care/economics/standards/*trends
Delivery of health care/organization & administration
Delivery obstetric/*methods
Delivery obstetric/*nursing/statistics & numerical data
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Direct service costs/statistics & numerical data
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Disease transmission professional-to-patient
Disease transmission professional-to-patient/*prevention & control
Disease transmission professional-to-patient/*statistics & numerical data
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Drug monitoring/*nursing
Drug monitoring/nursing/standards
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Economics nursing education continuing
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Education nursing continuing/*manpower
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Education nursing/*organization & administration
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Education nursing/economics
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Emergency nursing/*education/*methods
Emergency nursing/*education/standards
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Emergency service hospital/economics/*manpower
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Foreign professional personnel/*education
Foreign professional personnel/*education/*psychology/supply &
Foreign professional personnel/*education/psychology
Foreign professional personnel/*education/psychology/supply & distribution
Foreign professional personnel/*education/supply & distribution
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Foreign professional personnel/*legislation & jurisprudence
Foreign professional personnel/*legislation & jurisprudence/supply &
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Foreign professional personnel/*psychology/supply & distribution
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Foreign professional personnel/*supply & distribution
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Foreign professional personnel/education
Foreign professional personnel/education/*psychology
Foreign professional personnel/education/*psychology/supply & distribution
Foreign professional personnel/education/*supply& distribution
Foreign professional personnel/education/legislation &
Foreign professional personnel/education/psychology/*supply & distribution
Foreign professional personnel/legislation & jurisprudence/supply
Foreign professional personnel/standards
Foreign professional personnel/standards/statistics & numerical
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Health care reform/*trends
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Health manpower/*economics
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Holistic nursing/*education/*organization & administration
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Holistic nursing/education/*standards
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Hospital distribution systems/*standards
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Hospital mortality/*trends
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Hospital restructuring/manpower/methods
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Hospital units/*legislation & jurisprudence/*manpower
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Hospital units/economics/manpower/organization & administration
Hospital units/economics/organization & administration/*standards
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Hospitals community/*legislation & jurisprudence
Hospitals community/*manpower/organization & administration
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Hospitals district/manpower
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Hospitals private/*manpower
Hospitals private/economics/manpower
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Hospitals psychiatric/manpower/statistics & numerical data
Hospitals psychiatric/organization & administration/*standards
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Hospitals teaching/economics/manpower/organization & administration
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Hospitals teaching/manpower/*organization & administration/standards
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Inpatients/*education
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Intensive care units pediatric/*economics/manpower
Intensive care units pediatric/economics/manpower/utilization
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Intensive care units/economics/manpower
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Malpractice/*economics/*legislation & jurisprudence
Malpractice/*legislation & jurisprudence
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Maternal-child nursing/education/*methods
Maternal-child nursing/education/*organization & administration
Maternal-child nursing/education/organization & administration
Maternal-child nursing/manpower/*standards
Maternal-child nursing/methods/*standards
Medical errors/*adverse effects/*prevention & control
Medical errors/*nursing/prevention & control/*statistics & numerical data
Medical errors/*nursing/statistics & numerical data
Medical errors/nursing/prevention & control/*statistics & numerical data
Medical staff hospital/*economics/supply & distribution
Medication errors/*nursing/standards/statistics & numerical data
Medication errors/methods/nursing/*prevention &control
Neonatal nursing/*manpower/*methods
Neonatal nursing/*organization & administration
Neonatal nursing/*standards
Neonatal nursing/education/*organization & administration
Night care/*organization & administration
Nurse administrators/*education
Nurse administrators/*education/*organization & administration/psychology
Nurse administrators/*legislation & jurisprudence
Nurse administrators/*organization & administration
Nurse administrators/*organization & administration/*psychology
Nurse administrators/*organization & administration/psychology
Nurse administrators/economics/supply & distribution
Nurse administrators/education
Nurse administrators/education/*organization & administration
Nurse administrators/education/*psychology
Nurse administrators/education/organization & administration/*psychology
Nurse administrators/education/organization & administration/psychology
Nurse administrators/legislation & jurisprudence/psychology
Nurse administrators/statistics & numerical data

Nurse clinicians
Nurse clinicians/*organization & administration
Nurse clinicians/*organization & administration/*psychology
Nurse clinicians/*organization & administration/psychology
Nurse clinicians/*organization & administration/standards
Nurse clinicians/*standards
Nurse clinicians/*supply & distribution
Nurse clinicians/education
Nurse clinicians/education/*organization & administration
Nurse clinicians/education/*organization & administration/psychology
Nurse clinicians/education/standards/supply & distribution
Nurse clinicians/legislation & jurisprudence
Nurse clinicians/organization & administration
Nurse clinicians/psychology/*supply & distribution
Nurse's role*
Nurse's role/*psychology
Nurse-patient relations/*ethics
Nurses' aides
Nurses' aides/*economics/education/supply & distribution
Nurses' aides/*education
Nurses' aides/*organization & administration/psychology
Nurses' aides/*psychology
Nurses' aides/*standards
Nurses' aides/distribution
Nurses' aides/education/*organization & administration
Nurses' aides/education/*organization & administration/psychology
Nurses' aides/education/*psychology
Nurses' aides/education/*supply & distribution
Nurses' aides/education/*utilization
Nurses' aides/education/organization & administration
Nurses' aides/education/organization & administration/psychology
Nurses' aides/education/psychology
Nurses' aides/education/supply & distribution
Nurses' aides/legislation & jurisprudence
Nurses' aides/legislation & jurisprudence/utilization
Nurses' aides/organization & administration
Nurses' aides/organization & administration/psychology
Nurses' aides/psychology/*supply & distribution
Nurses' aides/standards
Nurses' aides/statistics & numerical data/*utilization
Nurses/*organization & administration
Nurses/*psychology
Nurses/economics/organization & administration/utilization
Nurses/economics/statistics & numerical data/*supply & distribution
Nurses/psychology
Nurses/psychology/*statistics & numerical data

Nurses/supply & distribution
Nursing administration research/*education
Nursing administration research/*methods
Nursing administration research/*methods/standards
Nursing administration research/*methods/statistics & numerical data
Nursing administration research/*organization & administration
Nursing administration research/methods
Nursing administration research/methods/standards
Nursing administration research/organization & administration
Nursing assessment
Nursing assessment/*ethics/methods
Nursing assessment/*legislation & jurisprudence
Nursing assessment/*methods
Nursing assessment/*methods/*statistics & numerical data
Nursing assessment/*methods/standards
Nursing assessment/*organization & administration
Nursing assessment/methods/standards/statistics & numerical data
Nursing audit/*methods
Nursing audit/*organization & administration
Nursing audit/organization & administration
Nursing care
Nursing care/*classification
Nursing care/*classification/methods
Nursing care/*methods
Nursing care/*methods/*psychology
Nursing care/*psychology
Nursing care/*psychology/*standards
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Nursing care/*utilization
Nursing care/classification
Nursing care/classification/*methods/standards/*statistics & numerical
Nursing care/classification/*psychology/*standards
Nursing care/manpower/methods/*statistics & numerical data
Nursing care/methods/*psychology
Nursing care/methods/organization & administration
Nursing care/organization & administration
Nursing care/psychology/standards
Nursing care/statistics & numerical data
Nursing diagnosis
Nursing diagnosis/*standards
Nursing diagnosis/*utilization
Nursing education research
Nursing evaluation research/*methods
Nursing evaluation research/*methods/standards
Nursing evaluation research/*organization & administration
Nursing evaluation research/methods

Nursing methodology research
Nursing methodology research/*methods
Nursing methodology research/*methods/*standards
Nursing methodology research/*methods/standards
Nursing methodology research/education/*methods
Nursing methodology research/methods/standards
Nursing process
Nursing process/*organization & administration
Nursing process/*statistics & numerical data
Nursing process/classification/standards/*statistics & numerical data
Nursing records
Nursing records*legislation & jurisprudence
Nursing records/*standards
Nursing records/*standards/statistics & numerical data
Nursing records/legislation & jurisprudence/*standards
Nursing records/standards
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Nursing records/statistics & numerical data
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Nursing research/education/*organization & administration
Nursing service hospital
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Hospital/*manpower/*standards
Nursing service hospital/*organization & administration
Nursing service hospital/*organization & administration/trends
Nursing service hospital/classification/*utilization
Nursing service hospital/classification/manpower/*organization
Nursing service hospital/economics
Nursing service hospital/economics/*organization & administration
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Nursing service hospital/economics/*trends
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Nursing service hospital/manpower/*organization &
Nursing service hospital/manpower/*organization & administration
Nursing service hospital/manpower/*organization & administration/trends
Nursing service
Nursing staff
Nursing staff hospital
Nursing staff hospital/*economics
Nursing staff hospital/*economics/*legislation & jurisprudence

Nursing staff hospital/*economics/*supply & distribution
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Nursing staff hospital/*economics/standards
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Nursing staff hospital/*education/*supply & distribution/trends
Nursing staff hospital/*education/organization
Nursing staff hospital/organization & administration
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Nursing staff hospital/*legislation & jurisprudence
Nursing staff hospital/*legislation & jurisprudence/*standards
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Nursing staff hospital/economics/*utilization
Nursing staff hospital/economics/education
Nursing staff hospital/legislation & jurisprudence
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Nursing staff hospital/legislation & jurisprudence/psychology/*supply &
Nursing staff hospital/organization & administration/*standards
Nursing staff hospital/organization & administration/*utilization
Nursing staff hospital/standards/*utilization
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Nursing staff hospital/statistics & numerical data/*supply & distribution
Nursing staff hospital/supply & distribution
Nursing staff hospital/supply & distribution/*trends
Nursing staff hospital/supply & distribution/*utilization

Nursing staff hospital/trends
Nursing theory
Nursing practical
Nursing practical
Nursing practical methods
Nursing practical/*legislation & jurisprudence
Nursing practical/*manpower
Nursing practical/*statistics & numerical data
Nursing practical/economics/*manpower
Nursing practical/education
Nursing practical/education/*manpower
Nursing practical/education/organization & administration
Nursing practical/education/standards
Nursing practical/legislation & jurisprudence
Nursing practical/standards
Nursing practical/statistics & numerical data
Nursing supervisory/*economics
Nursing supervisory/*legislation & jurisprudence
Nursing supervisory/*methods
Nursing supervisory/*organization & administration
Nursing supervisory/*standards
Nursing supervisory/economics
Nursing supervisory/legislation & jurisprudence
Nursing supervisory/methods
Nursing supervisory/organization & administration
Nursing supervisory/standards
Nursing team
Nursing team/*organization & administration
Nursing team/organization & administration
Nursing team/statistics & numerical data
Nursing/*manpower
Nursing/*manpower/trends
Nursing/*organization & administration
Oncologic nursing
Oncologic nursing/*manpower
Oncologic nursing/*methods/standards
Oncologic nursing/*organization & administration
Oncologic nursing/*standards
Oncologic nursing/economics/education/*manpower
Oncologic nursing/education
Oncologic nursing/legislation & jurisprudence
Oncologic nursing/manpower
Oncologic nursing/manpower/*standards
Oncologic nursing/methods/*standards
Oncologic nursing/statistics & numerical data
Orthopedic nursing/*organization & administration/standards

Outcome assessment (health care)/economics/*statistics & numerical data
Outcome assessment (health care) /methods
Outcome assessment (health care)/organization & administration
Outcome assessment (health care)/standards
Outcome and process assessment (health care)/*statistics & numerical data
Outcome and process assessment (health care)/economics
Process assessment (health care)/methods
Outcome and process assessment (health care)/organization & administration
Pain postoperative/*nursing
Pain postoperative/diagnosis/etiology/*nursing/*prevention & control
Pain postoperative/diagnosis/etiology/*nursing/psychology
Pain/*nursing
Pain/*nursing/*therapy
Pain/diagnosis/nursing
Patient care
Patient care planning
Patient care planning/*classification
Patient care planning/*economics/standards
Patient care planning/*methods
Patient care planning/*organization & administration
Patient care planning/economics/statistics & numerical data
Patient care planning/organization & administration
Patient care planning/organization & administration/*standards
Patient care team/*organization & administration
Patient care team/*standards
Patient care team/*statistics & numerical data
Patient care team/economics
Patient care team/economics/*organization & administration
Patient care team/economics /statistics & numerical data/*utilization
Patient care team/organization & administration
Patient care team/standards
Patient care/*economics
Patient care/economics
Patient readmission
Patient readmission/*statistics & numerical data
Patient readmission/economics
Patient readmission/statistics & numerical data
Patient transfer/manpower/*organization & administration/standards
Patient transfer/methods/*organization & administration
Patient transfer/methods/*standards
Patient transfer/methods/organization & administration/*standard
Patient-centered care
Patient-centered care/*economics
Patient-centered care/*ethics/organization & administration
Patient-centered care/*manpower
Patient-centered care/*manpower/*organization & administration

Patient-centered care/*methods
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Patient-centered care/*organization & administration/*statistics
Patient-centered care/*standards
Patient-centered care/*trends
Patient-centered care/economics/*manpower/standards
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Patient-centered care/methods
Patient-centered care/methods/*organization & administration
Patient-centered care/methods/*standards
Patient-centered care/organization & administration
Care/standards
Pediatric nursing
Pediatric nursing/*education
Pediatric nursing/*education/*organization & administration
Pediatric nursing/*history
Pediatric nursing/*legislation & jurisprudence
Pediatric nursing/*manpower
Pediatric nursing/*methods
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Pediatric nursing/*standards
Pediatric nursing/*statistics & numerical data
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Pediatric nursing/education/*methods/standards
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Pediatric nursing/manpower
Pediatric nursing/manpower/standards
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Pediatric nursing/statistics & numerical data
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Perioperative nursing/*manpower
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Perioperative nursing/*methods
Perioperative nursing/*organization & administration
Perioperative nursing/*organization & administration/standards

Perioperative nursing/*standards
Perioperative nursing/education
Perioperative nursing/education/*manpower
Perioperative nursing/education/*methods
Perioperative nursing/education/*methods/*standards
Perioperative nursing/education/methods/standards
Personal autonomy
Personal satisfaction
Personal space
Personality
Personality inventory
Personnel administration hospital
Personnel administration hospital/*legislation & jurisprudence
Personnel administration hospital/*methods
Personnel administration hospital/*methods/statistics & numerical data
Personnel administration hospital/*standards
Personnel administration hospital/*statistics & numerical data
Personnel administration hospital/economics
Personnel administration hospital/economics/*methods/trends
Personnel administration hospital/legislation & jurisprudence/*standards
Personnel administration hospital/methods
Personnel administration hospital/standards
Personnel administration hospital/standards/statistics & numerical data
Personnel management/*legislation & jurisprudence
Personnel management/*methods
Personnel management/*organization & administration
Personnel management/*standards
Personnel management/*trends
Personnel management/economics/*methods
Personnel management/methods
Personnel management/standards
Personnel staffing and scheduling information
Personnel staffing and scheduling information systems
Personnel staffing and scheduling information systems/*organization &
Personnel staffing and scheduling/*classification
Personnel staffing and scheduling/*classification/organization &
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Personnel staffing and scheduling/*legislation &
Personnel staffing and scheduling/*legislation & jurisprudence/standards
Personnel staffing and scheduling/*organization
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Personnel staffing and scheduling/economics/*legislation & jurisprudence
Personnel staffing and scheduling/legislation & jurisprudence/standards
Personnel staffing and scheduling/organization & administration/*standards

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Personnel turnover/*statistics & numerical data
Personnel turnover/*trends
Personnel turnover/economics
Personnel turnover/economics/*statistics & numerical data
Personnel turnover/statistics & numerical data/*trends
Personnel hospital/*statistics & numerical data
Personnel hospital/classification/economics/*supply & distribution
Personnel hospital/economics
Personnel hospital/education/*standards
Personnel hospital/education/psychology
Personnel hospital/legislation & jurisprudence
Personnel hospital/standards/*supply & distribution
Personnel hospital/statistics & numerical data/*utilization
Personnel hospital/statistics & numerical data/supply & distribution
Philosophy nursing
Pneumonia/classification/nursing
Postnatal care/economics/manpower/*organization & postoperative care/*nursing/*standards
Postoperative care/methods/nursing
Postoperative care/nursing/*standards
Postoperative care/nursing/psychology/statistics & numerical data
Preoperative care/*preoperative care/economics/*
Primary health care
Primary health care/*manpower
Primary health care/*organization & administration
Primary health care/organization & administration
Primary nursing care
Primary nursing care/*manpower
Primary nursing care/*methods
Primary nursing care/*organization & administration
Primary nursing care/manpower
Primary nursing care/methods/*standard
Primary nursing care/organization & administration
Primary nursing care/organization & administration/*standards
Primary nursing care/statistics & numerical data
Process assessment (health care)
Process assessment (health care) /organization & administration
Process assessment (health care)/methods
Professional competence
Professional competence/*standards
Progressive patient care
Progressive patient care/*manpower
Progressive patient care/*organization & administration
Progressive patient care/classification/*standards
Progressive patient care/organization & administration

Qualitative research
Quality assurance health care/*legislation & jurisprudence
Quality assurance health care/*methods
Quality assurance health care/*organization & administration
Quality assurance health care/*statistics & numerical data
Quality assurance health care/economics/trends
Quality assurance health care/legislation & jurisprudence
Quality assurance health care/methods
Quality assurance health care/organization & administration
Quality assurance health care/standards
Quality assurance health care/statistics & numerical data
Quality control
Quality indicators health care
Quality indicators health care/organization & administration
Quality indicators health care/*statistics & numerical data
Quality indicators health care/legislation & jurisprudence
Quality indicators health care/standards
Quality of health care/*legislation &
Quality of health care/*statistics & numerical data
Quality of health care/*trends
Quality of health care/legislation & jurisprudence
Quality of health care/organization & administration
Quality of health care/organization & administration/standards
Quality of health care/standards
Rehabilitation nursing/*legislation & jurisprudence
Rehabilitation nursing/*manpower/*methods
Restraint physical
Resuscitation
Resuscitation orders
Resuscitation/*education/standards
Resuscitation/*standards/statistics & numerical data
Risk management/*organization & administration
Risk management/*organization & administration/statistics & numerical data
Risk management/*standards
Risk management/*statistics & numerical data
Safety management/*
Safety management/*methods
Safety management/*organization & administration
Safety management/*standards
Safety management/legislation & jurisprudence
Safety management/methods
Safety management/methods/standards
Safety management/organization & administration
Safety/*legislation & jurisprudence
Safety/standards
Total quality management/*organization & administration

Total quality management/organization & administration
Unnecessary procedures/nursing/statistics & numerical data
Urinary catheterization/*adverse effects/*nursing
Urinary catheterization/adverse effects/*nursing
Urinary catheterization/nursing/*standards
Work schedule tolerance
Workload/*classification/economics
Workload/*legislation & jurisprudence
Workload/*legislation & jurisprudence/*standards
Workload/*legislation & jurisprudence/standards
Workload/*psychology
Workload/*psychology/statistics & numerical data
Workload/*standards
Workload/economics/statistics & numerical data
Workload/legislation & jurisprudence
Workload/legislation & jurisprudence/*standards/statistics & numerical data
Workload/legislation & jurisprudence/standards
Workload/legislation & jurisprudence/statistics & numerical data
Workload/psychology/*statistics & numerical data
Workload/statistics & numerical data
Workplace
Workplace/*organization & administration

Appendix B: List of Excluded Studies

1. Anonymous. Temporary or pseudo-permanent? Qld Nurse. Nov-Dec 1990;9(6):13. *Comment*.
2. Anonymous. Four easy ways to lose a job in nursing. Am J Nurs. Jun 1990;90(6):27-28. *Comment*.
3. Anonymous. Time oriented score system (TOSS): a method for direct and quantitative assessment of nursing workload for ICU patients. Italian Multicenter Group of ICU research (GIRTI). Intensive Care Med. 1991;17(6):340-345. *Not eligible target population.*
4. Anonymous. Flexible scheduling and part-time work. Focus Crit Care. Jun 1991;18(3):195-196, 198-199. *Comment*.
5. Anonymous. Infamous acuity system. Am J Nurs. Jun 1991;91(6):14. *Comment*.
6. Anonymous. An HIV-infected nurse must be reinstated. Am J Nurs. Dec 1992;92(12):9. *News*.
7. Anonymous. A case in point: "catch-all" clause protects nurses' rights. Mich Nurse. Mar 1992;65(3):19. *Legal cases.*
8. Anonymous. Draft guidelines on preventable medication errors. Am J Hosp Pharm. Mar 1992;49(3):640-648. *Guideline*.
9. Anonymous. Humanising the shiftwork systems. Qld Nurse. May-Jun 1992;11(3):23. *Comment*.
10. Anonymous. Nursing "cannibalistic" toward its elders, too. Nurs Manage. Oct 1993;24(10):8. *Letter*.
11. Anonymous. Mandatory AIDS testing could create hospital staffing problems. N J Med. May 1993;90(5):411. *News*.
12. Anonymous. Measuring neonatal nursing workload. Northern Neonatal Network. Arch Dis Child. May 1993;68(5 Spec No):539-543. *Not eligible target population*.
13. Anonymous. Self-scheduling guidelines. Pediatric unit. Mercy Hospital and Medical Center, San Diego, California. Aspens Advis Nurse Exec. Aug 1993;8(11):suppl 1. *Guideline*.
14. Anonymous. Low nursing staffing levels causing stress. OR Manager. Mar 1993;9(3):15, 26. *Comment*.
15. Anonymous. The challenge of operating within staffing budgets on the maternity unit at New England Memorial Hospital despite a fluctuating census. Qual Lett Healthc Lead. Feb 1993;5(1):15-17. *No association tested.*
16. Anonymous. NLN survey informs Dept. of Labor study. NLN Research & Policy PRISM Jun 1994;2(2):4-8. *Not relevant.*
17. Anonymous. Some guidelines for staffing in the absence of patient classification systems. Qld Nurse. Jul-Aug 1994;13(4):12. *Not eligible target population.*
18. Anonymous. Sister Susie. Lights, camera, traction! Nurs Stand. Feb 2-8 1994;8(19):47. *Not eligible target population.*
19. Anonymous. An issue of floating. Nursing. Nov 1994;24(11):76-77. *Legal cases.*
20. Anonymous. Enterprise bargaining in the private sector. Qld Nurse. Nov-Dec 1994;13(6):10-11. *Comment.*
21. Anonymous. Staffing patterns for patient care and support personnel in a general pediatric unit. American Academy of Pediatrics Committee on Hospital Care. Pediatrics. May 1994;93(5):850-854. *No association tested.*
22. Anonymous. And speaking of patient safety. AARN News Lett. Apr 1994;50(4):11. *Comment.*
23. Anonymous. Medication incident reporting forms. Lamp. Apr 1995;52(3):22-25. *Comment.*
24. Anonymous. Rebuilding a unit for seamless surgical care. OR Manager. Dec 1995;11(12):15-16. *Comment.*
25. Anonymous. Employees speak out. Testimonials help hospital recruit in- and out-of-state, boost staff morale and patient satisfaction. McLeod Regional Medical Center, Florence, SC. Profiles Healthc Mark. Mar-Apr 1995(64):2-7. *Comment*.
26. Anonymous. Stroke path calls for care when evaluating variances. Hosp Case Manag. Nov 1995;3(11):176-177. *Comment*.
27. Anonymous. Integrating an understanding of sleep knowledge into your practice (continuing education credit). Am Nurse. Mar 1995;27(2):20-21. *Comment*.
28. Anonymous. How do you know if your paycheck is correct? Ky Nurse. Jan-Mar 1995;43(1):11. *Comment*.
29. Anonymous. 38 hour week--your questions answered. Qld Nurse. Jan-Feb 1995;14(1):15-17. *Not eligible target population.*
30. Anonymous. A review of the use of DySSSy. Nurs Stand. Oct 9 1996;11(3):32. *Not eligible target population.*
31. Anonymous. Patient nurse dependency. Qld Nurse. Sep-Oct 1996;15(5):18. *Comment*.
32. Anonymous. IOM issues nursing staffing report: some positive recommendations yet report fails to address immediacy of hospital staffing problems. Am Nurse. Mar 1996;28(2):8; 23. *Comment*.
33. Anonymous. Position statement on minimum staffing in NICUs. Neonatal Netw. Mar 1996;15(2):48. *Review*.
34. Anonymous. Hospital nixes pathways, keeps case management. Hosp Case Manag. Jan 1996;4(1):6, 11-12. *Comment*.
35. Anonymous. Colorado case blurs line between board of nursing admin. law and criminal action. Am Nurse. Sep-Oct 1997;29(5):3. *Legal cases.*
36. Anonymous. Wound care team nips costly bed sore problems, slashes hospital expenses. Health Care Cost Reengineering Rep. Dec 1997;2(12):181-185; suppl 181-184. *Not eligible exposure.*
37. Anonymous. Nurses' report card project under way. Hosp Peer Rev. Jun 1997;22(6):76-78. *Comment.*
38. Anonymous. Renal transplantees have special education needs. Hosp Case Manag. Mar 1997;5(3):43-44, 49-51. *Not eligible exposure.*

39. Anonymous. Rx for cutting labor costs: add more registered nurses. Health Care Cost Reengineering Rep. Jun 1997;2(6):81-85. *No association tested.*
40. Anonymous. Patient commits suicide; hospital, nursing agencies settle for $700,000. Hosp Secur Saf Manage. Oct 1997;18(6):8-10. *Comment*.
41. Anonymous. Who should own case management within the continuum of care? Hosp Case Manag. Mar 1997;5(3):37-39. *Comment*.
42. Anonymous. Does an RN have the right to refuse to be floated to an area that she/he believes they are unqualified for? Chart. Apr 1997;94(4):5. *Comment*.
43. Anonymous. Cook County Hospital RNs take on restructuring. Chart. Nov 1997;94(11):1. *Comment*.
44. Anonymous. Issue: we never seem to have enough staffing on my unit. What can we do? Ohio Nurses Rev. Nov-Dec 1997;72(10):16. *Comment*.
45. Anonymous. Nurse staffing and quality of care in health care organizations research agenda of the Department of Health and Human Services, Agency for Health Care Policy and Research, National Institute for Nursing Research, Division of Nursing of HRSA. Nurs Outlook. Jul-Aug 1997;45(4):190-191. *News*.
46. Anonymous. What can you do to assist float nurses who are assigned to your unit? J N Y State Nurses Assoc. Jun 1997;28(2):19. *Comment*.
47. Anonymous. Patient abandonment. Nursing. Apr 1997;27(4):69. *Legal cases*.
48. Anonymous. Approaches to organising nursing shift patterns. Nurs Stand. Jan 22 1997;11(18):32-33. *No association tested.*
49. Anonymous. Hospital fails to diagnose CVA; EMTALA suit follows. Regan Rep Nurs Law. Mar 1998;38(10):1. *Comment*.
50. Anonymous. Voices from Colorado. Nurs Manage. Jun 1998;29(6):52-53. *Legal cases*.
51. Anonymous. To err is human to forgive is divine, as one nurse found out. Nurs Times. May 6-12 1998;94(18):49. *Comment*.
52. Anonymous. Cut pneumonia length of stay, costs, readmissions. Health Care Cost Reengineering Rep. Jan 1998;3(1):1-5; suppl 1-4. *Not eligible exposure.*
53. Anonymous. Telemetry unit moves from worst to best using redesign process. Patient Focus Care Satisf. Dec 1998;6(12):137-139. *Comment*.
54. Anonymous. Improving pain management for orthopedic patients at Hermann Hospital, Houston, TX. Qual Connect. Winter 1998;7(1):9. *Not eligible target population.*
55. Anonymous. The "take a nurse to lunch" program. A unique focus group improves and promotes food services. Health Care Food Nutr Focus. Oct 1998;15(2):5-7. *Not eligible exposure.*
56. Anonymous. Study reveals satisfaction with hospital experience major factor in decision to donate. Plus study finds health professionals not prepared to recommend donation. Nephrol News Issues. Jun 1998;12(6):64-66, 68. *Not eligible exposure.*
57. Anonymous. CVA (cerebrovascular accident) pathway cuts across seven hospital units. Hosp Case Manag. Feb 1998;6(2*):33-34.* Not eligible exposure.
58. Anonymous. Counter misleading data: adjust for patient acuity, indirect nursing hours. ED Manag. Mar 1998;10(3):29-30. *Comment.*
59. Anonymous. Are ED nursing staff levels under attack? Patient Focus Care Satisf. May 1998;6(5):59-62. *No association tested.*
60. Anonymous. How do you know you're productive in PACU (postanesthesia care unit)? OR Manager. Apr 1998;14(4):24-25. *Comment.*
61. Anonymous. Nursing staff levels under attack? Respond with data, increased efficiency. ED Manag. Mar 1998;10(3):25-29. *No association tested.*
62. Anonymous. Massachusetts board reprimands Dana-Farber nurses. Am Nurse. Sep-Oct 1999;31(5):6. *Comment.*
63. Anonymous. Court rules 'no duty to consult with Dr. Re Meds.' Case on point: Silves v. King, 970 P.2d 791-WA (1999). Regan Rep Nurs Law. Mar 1999;39(10):. *Legal cases*.
64. Anonymous. Fund to pay $10M: seeks contribution from nurse. Regan Rep Nurs Law. Mar 1999;39(10):1. *Legal cases.*
65 Anonymous. Defining provider roles. More work + changing roles = less satisfaction for providers and patients. Patient Focus Care Satisf. Nov 1999;7(11):121-123. *Comment*.
66. Anonymous. Foreign-educated nurses participate in the computerized clinical simulation testing (CST) pilot study. Issues 1999;20(1):5. *Not relevant.*
67. Anonymous. More RNs means fewer post-surgical complications. Mich Nurse. Mar 1999;72(3):9. *News*.
68. Anonymous. Cross-training programs offer scheduling flexibility. Patient Focus Care Satisf. Dec 1999;7(12):139-140. *Comment*.
69. Anonymous. Patient acuity profiles can keep you on budget. Patient Focus Care Satisf. Dec 1999;7(12):137-139. *No association tested.*
70. Anonymous. Take California's word: nurse staffing levels do impact quality of care. Patient Focus Care Satisf. Dec 1999;7(12):133-136. *Comment*.
71. Anonymous. Conscious sedation raises safe staffing concerns. Dimens Crit Care Nurs. Jan-Feb 1999;18(1):35. *Comment*.
72. Anonymous. Cutting RNs a false economy? Hosp Peer Rev. Feb 1999;24(2):29-30. *Comment.*
73. Anonymous. More RNs lower risk of UTIs, pneumonia. OR Manager. Jan 1999;15(1):7. *Comment.*
74. Anonymous. Appealing for compensation. Nursing. Mar 1999;29(3):25. *Legal cases.*
75. Anonymous. Critical care services and personnel: recommendations based on a system of categorization into two levels of care. American College of Critical Care Medicine of the Society of Critical Care Medicine. Crit Care Med. Feb 1999;27(2):422-426. *Review*.
76. Anonymous. Defining provider roles. Hartford uses report cards to teach nurses to teach. Patient Focus Care Satisf. Jan 2000;8(1):1-4. *Comment*.
77. Anonymous. Shortage spurs hunt for hospital staffing ratios. Patient Focus Care Satisf. Feb 2000;8(2):18-21. *No association tested.*

78. Anonymous. 'It's about safe care'. Nurses strike Tenet-owned St. Vincent over mandatory overtime. Revolution. Mar-Apr 2000;1(2):10. *News*.
79. Anonymous. Texas' nursing education system. Can it respond to this nursing shortage? Tex Nurs. Apr 2000;74(4):4-5, 11-12. *Comment*.
80. Anonymous. Staffing shortages mean increased opportunities. Crit Care Nurse. Feb 2000;Suppl:16. *Comment*.
81. Anonymous. NHS Direct will not cure ward-level staffing and skill-mix problems. Nurs Times. Mar 23-29 2000;96(12):3. *Not eligible target population.*
82. Anonymous. State of the nursing shortage. Am J Nurs. Dec 2000;100(12):20-21. *News*.
83. Anonymous. Frustrated by the nursing shortage? Try these tactics instead of bonuses. ED Manag. Oct 2000;12(10):109-113. *Comment*.
84. Anonymous. California nurses win landmark victory. Am J Nurs. Jan 2000;100(1):20. *News*.
85. Anonymous. Patient safety alert. Has the nursing shortage decreased health care quality? Hosp Peer Rev. Jan 2001;26(1):1-2. *Comment*.
86. Anonymous. ED makes nurses happy by outsourcing calls. ED Manag. Oct 2001;13(10):113-115. *Not eligible exposure.*
87. Anonymous. Striving to become the employer of choice: the relationship of employee and patient satisfaction. Healthc Leadersh Manag Rep. Jul 2001;9(7):9-15. *No association tested.*
88. Anonymous. Has the nursing shortage decreased health care quality? Healthc Benchmarks. Jan 2001;8(1):suppl 1-2. *Comment*.
89. Anonymous. For safety's sake, bill aims to eliminate overtime. Hosp Case Manag. May 2001;9(5):78, 66. *Interview*.
90. Anonymous. Rules proposal intended to clarify nurse staffing. Tex Nurs. Mar 2001;75(3):4-5. *Comment*.
91. Anonymous. Terminated nurse alleges hospital violated ADA. Case on point: Phelps v. Optima Health Inc., 2001 WL 563921 N.E.2d-NH. Nurs Law Regan Rep. Jul 2001;42(2):4. *Legal cases.*
92. Anonymous. Occupational health. Court told overwork led to breakdown. Nurs Times. Jun 28-Jul 4 2001;97(26):7. *Legal cases.*
93. Anonymous. Staff safety. Violent patients get the red card. Nurs Times. Jun 21-27 2001;97(25):4. *Comment*.
94. Anonymous. Brief encounters costing the NHS dear. J Nurs Manag. Nov 2001;9(6):353-356. *News*.
95. Anonymous. Guidelines for nurse staffing in intensive care: a consultation document (3rd draft, July 2001). Intensive Crit Care Nurs. Oct 2001;17(5):254-258. *News*.
96. Anonymous. Mandatory overtime bill caps off successful legislative year. Am Nurse. Nov-Dec 2001;33(6):3, 17. *Comment*.
97. Anonymous. 2001 salary survey results. Are you losing staff to other facilities? Here's what ED managers need to do. ED Manag. Nov 2001;13(11):suppl 1-4. *Comment*.
98. Anonymous. The staffing shortage: dealing with the here and now. Healthc Leadersh Manag Rep. Jul 2001;9(7):1-7. *No association tested.*
99. Anonymous. Linking staffing and quality issues. Jt Comm Perspect. Aug 2001;21(8):8-9. *Comment*.
100. Anonymous. Perspectives. Work environment a top issue in nurse retention. Med Health. Aug 13 2001;55(31):7-8. *News*.
101. Anonymous. Nurses rally to ban forced overtime. OR Manager. Jul 2001;17(7):6-7. *Comment*.
102. Anonymous. Senate confronts the nursing shortage. ED Manag. Apr 2001;13(4):45-46. *Review*.
103. Anonymous. Temp staff become a fixture in ORs. OR Manager. Jun 2001;17(6):15. *Comment*.
104. Anonymous. Interviews find some ORs have vacancies, others waiting lists. OR Manager. Jun 2001;17(6):1, 13-14. *Comment*.
105. Anonymous. New study gauges scope of nursing shortage. Hosp Peer Rev. Jun 2001;26(6):83-85, 74. *Comment*.
106. Anonymous. Staffing watch. Hosp Health Netw. Apr 2001;75(4):26. *News*.
107. Anonymous. Off-shift choices help to keep nurses. OR Manager. Feb 2001;17(2):20. *Comment*.
108. Anonymous. Anger over double HIV test. Nurs Times. Mar 8-14 2001;97(10):7. *News*.
109. Anonymous. Solutions to health care's labor shortages. Russ Coiles Health Trends. Nov 2001;14(1):8-12. *Comment*.
110. Anonymous. Nurse's unintentional error is not 'willful misconduct'. Nurs Law Regan Rep. Jan 2002;42(8):1. *Legal cases.*
111. Anonymous. Staff collaboration boosts adoption of best practices. Rn. Nov 2002;65(11):34hf32-35. *Comment*.
112. Anonymous. Patient safety alert. Closer link made between nursing shortage, safety. Healthcare Benchmarks Qual Improv. Oct 2002;9(10):suppl 1-3. *Comment*.
113. Anonymous. JCAHO: nurse shortage threat to patient safety. OR Manager. Sep 2002;18(9):8. *Review*.
114. Anonymous. JCAHO: nursing shortage puts patients at risk, demands immediate attention. Hosp Peer Rev. Sep 2002;27(9):117-119. *Comment*.
115. Anonymous. Nurses may be your best tool for improving quality of care. Hosp Peer Rev. Aug 2002;27(8):105-108. *No association tested.*
116. Anonymous. Sentinel event leads to safety checklist. Hosp Peer Rev. Jul 2002;27(7):91-94, 99. *Comment*.
117. Anonymous. Medication error. Salty language. Nursing. Apr 2002;32(4):12. *Comment*.
118. Anonymous. Greater nursing staff levels result in better care for hospital patients. Health Care Strateg Manage. Jun 2002;20(6):12. *Comment*.
119. Anonymous. California releases proposed nurse-to-patient ratios for acute care hospitals. Prairie Rose. Mar-May 2002;71(1):1, 3. *Comment*.
120. Anonymous. In our hands and in our hearts: finding solutions to the staffing crisis. Healthc Leadersh Manag Rep. Dec 2002;10(12):1-8. *Comment*.

121. Anonymous. The business planning framework--nursing resources. Qld Nurse. Sep-Oct 2002;21(5):13. *Comment*.
122. Anonymous. Developing a plan to improve the odds of retaining your staff. OR Manager. Dec 2002;18(12):1, 10-11. *Review*.
123. Anonymous. Spotlight on nursing. A focus on lasting workplace solutions. Tex Nurs. Aug 2002;76(7):8-10, 14. *Comment*.
124. Anonymous. Inadequate staffing linked to poor patient outcomes. Nurs Manage. Sep 2002;33(9):20. *Review*.
125. Anonymous. Senate and Assembly hold joint health committee hearing on nursing shortage and nurse staffing crisis. N J Nurse. Jul-Aug 2002;32(6):1, 6. *Review*.
126. Anonymous. OR staffing holds up, but coping with shortage is more challenging. OR Manager. Sep 2002;18(9):1, 11, 14-16 passi. *Comment*.
127. Anonymous. PSNA mandatory overtime survey summary. Pennsylvania Nurse Aug-Sep 2002;57(7):8-9. *Not peer reviewed.*
128. Anonymous. Proposed staffing rules pass. Implementation begins. Tex Nurs. Mar 2002;76(3):8-9. *Comment*.
129. Anonymous. Web survey. March results: 'nurse staffing--beyond the ratios'. Mod Healthc. Apr 8 2002;32(14):35. *Web survey*.
130. Anonymous. Tough times in healthcare. J Nurs Adm. Mar 2002;32(3):122. *Letter*.
131. Anonymous. Hashing out California's staffing ratios. Am Nurse. Mar-Apr 2002;34(2):1, 16-17. *Comment*.
132. Anonymous. Position statement on intensive care nursing staffing. Aust Crit Care. Feb 2002;15(1):6-7. *Not eligible target population.*
133. Anonymous. Faced with staffing minimums, hospitals lure nurses with sign-on bonuses. Nephrol News Issues. Apr 2002;16(5):63. *Comment*.
134. Anonymous. Guidance paper: refocusing the role of the midwife. RCM Midwives J. Apr 2002;5(4):128-133. *Not eligible target population.*
135. Anonymous. Survey shows increasing vacancy rates. Synergy News Aug 2002:20-1. *Not peer reviewed.*
136. Anonymous. By the numbers. Staffing. Mod Healthc. Dec 23 2002;Suppl:44, 46, 48. *Comment*.
137. Anonymous. Data trends. The true cost of overtime. Healthc Financ Manage. Dec 2002;56(12):90. *No association tested.*
138. Anonymous. NY: nurse learns of pt's doubt re surgery site: hospital liabile for operation on wrong hand. Nurs Law Regan Rep. Dec 2003;44(7):3. *Legal cases*.
139. Anonymous. Deplorable ICU nursing results in $2.4 million judgment. Case on point: Mobile Infirmary Medical Center v. Hodgen, 2003 WL 22463340 so.2d--AL. Nurs Law Regan Rep. Nov 2003;44(6):2. *Legal cases.*
140. Anonymous. AL: wrong epinephrine dose--cardiac arrest: Ct. emphasizes the '5 Rs' of drug administration. Nurs Law Regan Rep. Sep 2003;44(4):3. *Legal cases.*
141. Anonymous. Making your mark. Nursing. Aug 2003;33(8):18. *News*.
142. Anonymous. Nurses and pharmacists partner for patient safety. Healthcare Benchmarks Qual Improv. Aug 2003;10(8):92-93. *Comment*.
143. Anonymous. IL: Discovery of disciplining of RN post pt.'s death: RN's voluntary termination too remote in time. Nurs Law Regan Rep. Jan 2003;43(8):3. *Legal cases.*
144. Anonymous. RN's comp. claim based on PTSD resulting from short staffing, etc. Case on point: Smith-Price v. Charter Pines Behavioral Ctr., 584 S.E.2d 881-NC. Nurs Law Regan Rep. Sep 2003;44(4):2. Legal cases.
145. Anonymous. Do you address staffing effectiveness standards? Hosp Peer Rev. Sep 2003;28(9):122, 127-128. *Comment*.
146. Anonymous. ANA applauds federal legislation to mandate safe nurse-to-patient ratios. Ky Nurse. Jul-Sep 2003;51(3):6. *News*.
147. Anonymous. Federal safe staffing bill introduced. Am Nurse. May-Jun 2003;35(3):1, 5. *News*.
148. Anonymous. Tales from the trenches. Patient Care Manag. Feb 2003;19(2):10-12. *Comment*.
149. Anonymous. 5 resolutions for a happy 2003. Patient Care Manag. Jan 2003;19(1):1, 4-6. *Comment*.
150. Anonymous. CA: Nurse errs in giving pitocin to stop labor: father's suit for emotional distress fails. Nurs Law Regan Rep. Oct 2004;45(5):3. *Legal cases.*
151. Anonymous. Nurse sued when child dies from error in interpreting drug dosage. Nurs Law Regan Rep. Oct 2004;45(5):1. *Legal cases.*
152. Anonymous. Study shows 12-hour shifts increase errors. Healthcare Benchmarks Qual Improv. Sep 2004;11(9):105-106. *Comment*.
153. Anonymous. Adverse events. Focus on patient safety. Can Nurse. Feb 2004;100(2):30. *Comment*.
154. Anonymous. Nurses identify barriers to educating patients about meds. Hosp Health Netw. Jan 2004;78(1):64. *Comment*.
155. Anonymous. California patient care labor costs rise under staffing requirements. Healthc Financ Manage. Nov 2004;58(11):118. *Comment*.
156. Anonymous. Veteran nurses give patients a quick look to avoid waits. Perform Improv Advis. Aug 2004;8(8):85-87. *Comment*.
157. Anonymous. Preliminary report, mandatory overtime by RNs in Louisiana 2004 Louisiana Registered Nurse Population Survey. Pelican news Mar 2004;60(1):20. *Not peer reviewed.*
158. Anonymous. Shifts go up for bid: hospitals see boost in patient care, staff morale. Healthcare Benchmarks Qual Improv. Oct 2004;11(10):109-112. *Comment.*
159. Anonymous. Reducing junior doctors' hours will extend opportunities for nurses. Nurs Times. Jul 27-Aug 2 2004;100(30):15. *Comment.*
160. Anonymous. Levels of care: the impact of nurse-patient ratios. Prof Nurse. Jul 2004;19(11):6-7. *News*.
161. Anonymous. Research shows Michigan safe patient care initiatives save lives and money. Mich Nurse. Jun-Jul 2004:8. *News*.
162. Anonymous. Staffing the ED despite the nursing shortage. Rn. Feb 2004;67(2):26hf21-26hf22. *Comment*.

163. Anonymous. Flexible job options help maintain quality. Healthcare Benchmarks Qual Improv. Jan 2004;11(1):8-9. *Comment*.
164. Anonymous. JCAHO's 2006 National Patient Safety Goals: handoffs are biggest challenge. Hosp Peer Rev. Jul 2005;30(7):89-93. *Comment*.
165. Anonymous. Nurse terminated for meds. error: hospital attempts to deny access to records. Case on point: Chapman v. Health & Hospital Corporations, 2005 WL 697435--NY. Nurs Law Regan Rep. May 2005;45(12):2. *Legal cases*.
166. Anonymous. More than 40% of nurse errors not from medication. Healthcare Benchmarks Qual Improv. Apr 2005;12(4):41-43. *Comment*.
167. Anonymous. Women need flexible schedules and challenging assignments. Health Care Strateg Manage. Jun 2005;23(6):12. *Comment*.
168. Anonymous. AR:12-hour-shift RN falls on trip to cafeteria: workers' compensation benefits awarded to nurse. Nurs Law Regan Rep. Apr 2005;45(11):3. *Legal cases*.
169. Anonymous. AACN standards for establishing and sustaining healthy work environments: a journey to excellence. Am J Crit Care. May 2005;14(3):187-197. *Review*.
170. Anonymous. Position paper on safe staffing. Tar Heel Nurse. Jan-Feb 2005;67(1):20. *Review*.
171. Anonymous. An opportunity to shape patient care. Nurs Times. Jun 14-20 2005;101(24):69. *Not eligible target population*.
172. Anonymous. Wright S. Nursing development? Nurs Stand. Jun 12-18 1991;5(38):52-53. *No association tested.*
173. Abbott A, Barrow S, Lopresti F, et al. International employment in clinical practice: influencing factors for the dental hygienist. International Journal of Dental Hygiene Feb 2005;3(1):37-44. *Not relevant.*
174. Abbott J, Young A, Haxton R, Van Dyke P. Collaborative care: a professional model that influences job satisfaction. Nurs Econ. May-Jun 1994;12(3):167-169, 174. *Not eligible exposure.*
175. Abbott ME. Measuring the effects of a self-scheduling committee. Nurs Manage. Sep 1995;26(9):64A-64B, 64D, 64G. *Not eligible outcomes.*
176. Ackerman MH, Henry MB, Graham KM, Coffey N. Humor won, humor too: a model to incorporate humor into the healthcare setting. Nurs Forum. Oct-Dec 1993;28(4):9-16. *Not eligible exposure.*
177. Ackley NL. Is a serious nurse shortage coming? Tex Nurs. Mar 1999;73(3):10-13. *Comment*.
178. Adam S. Plugging the gap--critical care skills are the current universal commodity. Nurs Crit Care. Sep-Oct 2004;9(5):195-198. *Editorial*.
179. Adams A, Bond S. Clinical specialty and organizational features of acute hospital wards. J Adv Nurs. Dec 1997;26(6):1158-1167. *Not eligible target population.*
180. Adams A, Bond S. Staffing in acute hospital wards: part 2. Relationships between grade mix, staff stability and features of ward organizational environment. J Nurs Manag. Sep 2003;11(5):293-298. *Not eligible target population.*
181. Adams A, Bond S. Staffing in acute hospital wards: part 1. The relationship between number of nurses and ward organizational environment. J Nurs Manag. Sep 2003;11(5):287-292. *Not eligible target population.*
182. Adams B. Are we our own jail keepers? Revolution. Nov-Dec 2000;1(6):30-31. *Comment*.
183. Adams B. Profile: Barry Adams in his own words. Revolution. Jan-Feb 2000;1(1):10-11. *Interview*.
184. Adams B. Accountable but powerless. Health Aff (Millwood). Jan-Feb 2002;21(1):218-223. *Comment*.
185. Adams DA. The relationship between use of varying proportions of part-time faculty and full-time nursing faculty perceptions of workload and collegial support. *Not relevant.*
186. Adams DA. The relationship between use of varying proportions of part-time faculty and full-time nursing faculty perceptions of workload and collegial support. *Not relevant.*
187. Adams K, Murphy J. Addressing barriers in headache care. Interview by Janis Smy. Nurs Times. May 11-17 2004;100(19):26-27. *Interview*.
188. Adams KS, Zehrer CL, Thomas W. Comparison of a needleless system with conventional heparin locks. Am J Infect Control. Oct 1993;21(5):263-269. *Not eligible exposure.*
189. Adamsen L, Rasmussen JM. Exploring and encouraging through social interaction: a qualitative study of nurses' participation in self-help groups for cancer patients. Cancer Nurs. Feb 2003;26(1):28-36. *Not eligible target population.*
190. Adamsen L, Tewes M. Discrepancy between patients' perspectives, staff's documentation and reflections on basic nursing care. Scand J Caring Sci. 2000;14(2):120-129. *Not eligible target population.*
191. Adejumo O. Divergent backgrounds, unified goals: continuing education program for multinational nurses in a hospital in the Middle East. J Contin Educ Nurs. Mar-Apr 1999;30(2):79-83. *Not eligible target population.*
192. Adomat R, Hewison A. Assessing patient category/dependence systems for determining the nurse/patient ratio in ICU and HDU: a review of approaches. J Nurs Manag. Sep 2004;12(5):299-308. *Not eligible target population.*
193. Adomat R, Hicks C. Measuring nursing workload in intensive care: an observational study using closed circuit video cameras. J Adv Nurs. May 2003;42(4):402-412. *Not eligible target population.*
194. Agbo M. Up to one's eyes. Nurs Stand. Oct 25-31 1995;10(5):55. *Comment*.
195. Agnew T. Making a difference. Nurs Times. Jun 7-13 1995;91(23):18. *News*.

196. Ahmad MM, Alasad JA. Predictors of patients' experiences of nursing care in medical-surgical wards. Int J Nurs Pract. Oct 2004;10(5):235-241. *Not eligible target population.*
197. Ahmann E. Examining assumptions underlying nursing practice with children and families. Pediatr Nurs. Sep-Oct 1998;24(5):467-469. *No association tested.*
198. Ahmed DS, Fecik S. The fatigue factor. When long shifts harm patients. Am J Nurs. Sep 1999;99(9):12. *Case reports.*
199. Ahmed DS, Hamrah PM. Right drug, wrong dose. Am J Nurs. Jan 1999;99(1 Pt 1):12. *Case reports.*
200. Ahmed S. Out-patients in vogue. Nurs Stand. May 18-24 1994;8(34):40. *Comment*.
201. Ahrens T, Yancey V, Kollef M. Improving family communications at the end of life: implications for length of stay in the intensive care unit and resource use. Am J Crit Care. Jul 2003;12(4):317-323; discussion 324. *Not eligible exposure.*
202. Aiken LH. More nurses, better patient outcomes: why isn't it obvious? Eff Clin Pract. Sep-Oct 2001;4(5):223-225. *Comment*.
203. Aiken LH. Evidence of our instincts: an interview with Linda H. Aiken. Interview by Alison P. Smith. Nurs Econ. Mar-Apr 2002;20(2):58-61. *Not eligible target population.*
204. Aiken LH, Buchan J, Sochalski J, Nichols B, Powell M. Trends in international nurse migration. Health Aff (Millwood). May-Jun 2004;23(3):69-77. *Not eligible exposure.*
205. Aiken LH, Clarke SP, Silber JH, Sloane D. Hospital nurse staffing, education, and patient mortality. LDI Issue Brief. Oct 2003;9(2):1-4. *Comment*.
206. Aiken LH, Clarke SP, Sloane DM. Hospital restructuring: does it adversely affect care and outcomes? J Nurs Adm. Oct 2000;30(10):457-465. *Published twice.*
207. Aiken LH, Clarke SP, Sloane DM. Hospital staffing, organization, and quality of care: cross-national findings. Int J Qual Health Care. Feb 2002;14(1):5-13. *Not eligible target population.*
208. Aiken LH, Clarke SP, Sloane DM. Hospital staffing, organization, and quality of care: Cross-national findings. Nurs Outlook. Sep-Oct 2002;50(5):187-194. *Not eligible target population.*
209. Aiken LH, Havens DS, Sloane DM. The Magnet Nursing Services Recognition Program. Am J Nurs. Mar 2000;100(3):26-35; quiz 35-26. *Not eligible exposure.*
210. Aiken LH, Havens DS, Sloane DM. Magnet nursing services recognition programme. Nurs Stand. Mar 8-14 2000;14(25):41-47. *No association tested.*
211. Aiken LH, Patrician PA. Measuring organizational traits of hospitals: the Revised Nursing Work Index. Nurs Res. May-Jun 2000;49(3):146-153. *Review*.
212. Aiken LH, Sloane DM, Klocinski JL. Hospital nurses' occupational exposure to blood: prospective, retrospective, and institutional reports. Am J Public Health. Jan 1997;87(1):103-107. *Not eligible outcomes.*
213. Aiken LH, Sloane DM, Lake ET. Satisfaction with inpatient acquired immunodeficiency syndrome care. A national comparison of dedicated and scattered-bed units. Med Care. Sep 1997;35(9):948-962. *Not eligible exposure.*
214. Aiken LH, Sloane DM, Lake ET, Sochalski J, Weber AL. Organization and outcomes of inpatient AIDS care. LDI Issue Brief. Sep 1999;5(1):1-4. *Comment*.
215. Aikens A. Colors of the spectrum. Agency/registry nursing. Nurs Spectr (Wash D C). Nov 27 1995;5(24):16. *Comment*.
216. Aitken LM. Critical care nurses' use of decision-making strategies. J Clin Nurs. Jul 2003;12(4):476-483. *Not eligible target population.*
217. Akid M. Pay. Nurses threaten to quit bank as rates are slashed. Nurs Times. Jul 5-11 2001;97(27):9. *News*.
218. Akid M. 800m pounds: the government's incentive to end NHS reliance on agency nurses. Nurs Times. Sep 6-12 2001;97(36):12-13. *Not eligible target population.*
219. Akid M. The camera never lies. Nurs Times. Mar 29-Apr 4 2001;97(13):10-11. *News*.
220. Albarran J, Scholes J. Blurred, blended or disappearing--the image of critical care nursing. Nurs Crit Care. Jan-Feb 2005;10(1):1-3. *Editorial.*
221. Alberts MJ, Chaturvedi S, Graham G, Hughes RL, Jamieson DG, Krakowski F, Raps E, Scott P. Acute stroke teams: results of a national survey. National Acute Stroke Team Group. Stroke. Nov 1998;29(11):2318-2320. *Not eligible outcomes.*
222. Alcock D, Jacobsen MJ, Sayre C. Competencies related to medication administration and monitoring. Can J Nurs Adm. Sep 1997;10(3):54-73. *Not eligible target population.*
223. Alcock D, Lawrence J, Goodman J, Ellis J. Formative evaluation: implementation of primary nursing. Can J Nurs Res. Fall 1993;25(3):15-28. *Not eligible outcomes.*
224. Alderman C. Nursing overseas: caring in a divided community. Nurs Stand. Apr 7-13 1993;7(29):22-23. *Comment*.
225. Alex J, Rao VP, Cale AR, Griffin SC, Cowen ME, Guvendik L. Surgical nurse assistants in cardiac surgery: a UK trainee's perspective. Eur J Cardiothorac Surg. Jan 2004;25(1):111-115. *Not eligible target population.*
226. Alexander C, Palladino M, Evans B, Harp K, Marable K, Whitmer K. Self-scheduling: two success stories. The art of the deal. Am J Nurs. Mar 1993;93(3):70-74. *Comment*.
227. Alimoglu MK, Donmez L. Daylight exposure and the other predictors of burnout among nurses in a University Hospital. Int J Nurs Stud. Jul 2005;42(5):549-555. *Not eligible target population.*
228. Allan D, Cornes D. The impact of management of change projects on practice: a description of the contribution that one educational programme made to the quality of health care. J Adv Nurs. Apr 1998;27(4):865-869. *Not eligible target population.*
229. Allanach H. Go with the flow. Nurs Stand. Nov 10-16 1999;14(8):23. *Not eligible target population.*

230. Allen C, Heffernan C, Pallent S, Weaver L. Uniforms: a strange custom? Nurs Times. Sep 2-8 1992;88(36):51. *Comment*.
231. Allen CI, Turner PS. The effect of an intervention programme on interactions on a continuing care ward for older people. J Adv Nurs. Oct 1991;16(10):1172-1177. *Not eligible target population.*
232. Allen J, Mellor D. Work context, personal control, and burnout amongst nurses. West J Nurs Res. Dec 2002;24(8):905-917. *Not eligible target population.*
233. Allen SK, Wilder K. Back belts pay off for nurses. Occup Health Saf. Jan 1996;65(1):59-62. *Not Eligible exposure.*
234. Alleyne J, Thomas VJ. The management of sickle cell crisis pain as experienced by patients and their carers. J Adv Nurs. Apr 1994;19(4):725-732. *Not eligible target population.*
235. Allgood C, O'Rourke K, VanDerslice J, Hardy MA. Job satisfaction among nursing staff in a military health care facility. Mil Med. Oct 2000;165(10):757-761. *Not eligible target population.*
236. AllisonJones LL. Student and faculty perceptions of teaching effectiveness of full-time and part-time associate degree nursing faculty. *Not relevant.*
237. AllisonJones LL, Hirt JB. Comparing the teaching effectiveness of part-time & full-time clinical nurse faculty. Nursing Education Perspectives Sep-Oct 2004;25(5):238-43. *Not relevant.*
238. al-Ma'aitah R, Momani M. Assessment of nurses' continuing education needs in Jordan. J Contin Educ Nurs. Jul-Aug 1999;30(4):176-181. *Not eligible target population.*
239. Almeida SL. Legislating nurse-patient ratios: A controversial approach to improving patient care? J Emerg Nurs. Oct 2002;28(5):377-378. *Editorial*.
240. Alspach G. Nurse staffing and patient outcomes. This is news? Crit Care Nurse. Feb 2003;23(1):14-15. *Editorial*.
241. Alspach G. When your work conditions are sicker than your patients. Crit Care Nurse. Jun 2005;25(3):11-12, 14. *Editorial*.
242. Altimier LB, Sanders JM. Cross-training in 3-D. Nurs Manage. Nov 1999;30(11):59-62. *Comment*.
243. Altman S. Arbitrator upholds RN's refusal to work unsafe assignment. Chart. May 1997;94(5):1, 4. *Legal cases.*
244. Alward RR. Study links rotating shift work and nurses' risk of coronary heart disease. Am Nurse. Mar 1996;28(2):12. *Comment*.
245. Alward RR, Monk TH. A comparison of rotating-shift and permanent night nurses. Int J Nurs Stud. 1990;27(3):297-302. *Not eligible outcomes.*
246. Alward RR, Monk TH. A 'round-the-clock' profession: coping with the effects of shift work. Nev Rnformation. Nov 1995;4(4):18-19. *Comment*.
247. Amato M, Perton L, Sullivan B. Buttons, buttons, and more buttons: are they professional? J Nurs Adm. Dec 2001;31(12):559-560. *Interview*.
248. Ambrose C. Recruitment problems in intensive care: a solution. Nurs Stand. Dec 4-10 2002;17(12):39-40. *Not eligible target population.*
249. Andersen SE. Implementing a new drug record system: a qualitative study of difficulties perceived by physicians and nurses. Qual Saf Health Care. Mar 2002;11(1):19-24. *Not eligible target population.*
250. Anderson C. Enteral feeding: a change in practice. J Child Health Care. Winter 2000;4(4):160-162. *Not eligible target population.*
251. Anderson DJ, Webster CS. A systems approach to the reduction of medication error on the hospital ward. J Adv Nurs. Jul 2001;35(1):34-41. *Not eligible target population.*
252. Anderson FD, Maloney JP, Beard LW. A descriptive, correlational study of patient satisfaction, provider satisfaction, and provider workload at an army medical center. Mil Med. Feb 1998;163(2):90-94. *Not eligible target population.*
253. Anderson FD, Maloney JP, Knight CD, Jennings BM. Utilization of supplemental agency nurses in an Army medical center. Mil Med. Jan 1996;161(1):48-53. *Not eligible target population.*
254. Anderson LA, Schramm CA. Adapting charting by exception to the perianesthesia setting. J Perianesth Nurs. Oct 1999;14(5):260-269. *Comment*.
255. Anderson MA, Clarke MM, Helms LB, Foreman MD. Hospital readmission from home health care before and after prospective payment. J Nurs Scholarsh. 2005;37(1):73-79. *Not eligible target population.*
256. Anderson RM. Economic and quality of care issues with implications for scopes of practice--physicians and nurses. Aspens Advis Nurse Exec. Apr 1994;9(7):suppl 1. *Interview*.
257. Anderson S, Eadie DR, MacKintosh AM, Haw S. Management of alcohol misuse in Scotland: the role of A&E nurses. Accid Emerg Nurs. Apr 2001;9(2):92-100. *Not eligible target population.*
258. Anderson S, Wittwer W. Using bar-code point-of-care technology for patient safety. J Healthc Qual. Nov-Dec 2004;26(6):5-11. *Not eligible exposure.*
259. Anderson TA, Hart GK. Data clarification. Aust Crit Care. Feb 2002;15(1):4; author reply 4-5. *Comment*.
260. Ando S, Ono Y, Shimaoka M, Hiruta S, Hattori Y, Hori F, Takeuchi Y. Associations of self estimated workloads with musculoskeletal symptoms among hospital nurses. Occup Environ Med. Mar 2000;57(3):211-216. *Not eligible target population.*
261. Ang R, Fong LC. Nursing leadership: the Singapore experience. Reflect Nurs Leadersh. 2003;29(1):26-28. *Not eligible target population.*
262. Angeles-Llerenas A, Alvarez del Rio A, Salazar-Martinez E, Kraus-Weissman A, Zamora-Munoz S, Hernandez-Avila M, Lazcano-Ponce E. Perceptions of nurses with regard to doctor-patient communication. Br J Nurs. Dec 11-2004 Jan 7 2003;12(22):1312-1321. *Not eligible target population.*
263. Angus J, Hodnett E, O'Brien-Pallas L. Implementing evidence-based nursing practice: a tale of two intrapartum nursing units. Nurs Inq. Dec 2003;10(4):218-228. *Not eligible outcomes*.
264. Anshus JS. The mentality of contraction. Am J Emerg Med. Jan 1996;14(1):114. *Letter*.

265. Anthony MK. The relationship of authority to decision-making behavior: implications for redesign. Res Nurs Health. Oct 1999;22(5):388-398. *Not eligible exposure.*
266. Anthony MK, Hudson-Barr D. A patient-centered model of care for hospital discharge. Clin Nurs Res. May 2004;13(2):117-136. *Not eligible exposure.*
267. Anton D. Meet the travelers. Danielle Anton. Rn. Jan 2004;Suppl:22. *Interview*.
268. Aquila A. The Vascular Project: using data to improve processes and outcomes. J Vasc Nurs. Sep 2001;19(3):80-86. *Not eligible exposure.*
269. Arafa MA, Nazel MW, Ibrahim NK, Attia A. Predictors of psychological well-being of nurses in Alexandria, Egypt. Int J Nurs Pract. Oct 2003;9(5):313-320. *Not eligible target population.*
270. Arbesman MC, Wright C. Mechanical restraints, rehabilitation therapies, and staffing adequacy as risk factors for falls in an elderly hospitalized population. Rehabil Nurs. May-Jun 1999;24(3):122-128. *No association tested.*
271. Archibald G. A post-modern nursing model. Nurs Stand. May 10-16 2000;14(34):40-42. *Not eligible target population.*
272. Arford PH, Allred CA. Value = quality + cost. J Nurs Adm. Sep 1995;25(9):64-69. *No association tested.*
273. Armstrong M. Staff mix and public safety. Nurs BC. Oct 2004;36(4):5-6. *Letter*.
274. Armstrong-Stassen M, Cameron SJ, Horsburgh ME. Downsizing-initiated job transfer of hospital nurses: how do the job transferees fare? J Health Hum Serv Adm. Spring 2001;23(4):470-489. *Not eligible outcomes.*
275. Arndt M. Medication errors. Research in practice: how drug mistakes affect self-esteem. Nurs Times. Apr 13-19 1994;90(15):27-30. *Comment*.
276. Arranz P, Ulla SM, Ramos JL, Del Rincon C, Lopez-Fando T. Evaluation of a counseling training program for nursing staff. Patient Educ Couns. Feb 2005;56(2):233-239. *Not eligible target population.*
277. Arsenault S. Staffing is a concern in telemetry. Crit Care Nurse. Oct 2000;20(5):14-16. *Comment.*
278. Arthur D. The validity and reliability of the measurement of the concept 'expressed emotion' in the family members and nurses of Hong Kong patients with schizophrenia. Int J Ment Health Nurs. Sep 2002;11(3):192-198. *Not eligible target population.*
279. Arts SE, Francke AL, Hutten JB. Liaison nursing for stroke patients: results of a Dutch evaluation study. J Adv Nurs. Aug 2000;32(2):292-300. *Not eligible target population.*
280. Artz M. Setting nurse-patient ratios: ANA bill calls for development of staffing systems in hospitals. Am J Nurs. May 2005;105(5):97. *News*.
281. Arvanitopulos BL, Camino MK. You're pulling me where? Medsurg Nurs. Dec 1998;7(6):371-373. *Comment*.
282. Asch DA. Use of a coded postcard to maintain anonymity in a highly sensitive mail survey: cost, response rates, and bias. Epidemiology. Sep 1996;7(5):550-551. *Not eligible exposure.*
283. Ashe N, Manzo L. Get customer sensitive. Nurs Manage. Jan 2002;33(1):50-51. *Comment*.
284. Astelm J. Elizabeth and Alexandra's story. Child Care Health Dev. Nov 1995;21(6):369-375. *Case reports.*
285. Atencio BL, Cohen J, Gorenberg B. Nurse retention: is it worth it? Nurs Econ. Nov-Dec 2003;21(6):262-268, 299, 259. *Not eligible outcomes.*
286. Atkins PM, Marshall BS, Javalgi RG. Happy employees lead to loyal patients. Survey of nurses and patients shows a strong link between employee satisfaction and patient loyalty. J Health Care Mark. Winter 1996;16(4):14-23. *Not eligible exposure.*
287. Atkinson M. Arbitrator: hospital must tie admissions to RN staffing. Revolution. Mar-Apr 2005;6(2):9. *Comment.*
288. Austin S. Staffing: know your liability. Nurs Manage. Jul 2000;31(7):19. *Legal cases.*
289. Aveyard B. Education and person-centred approaches to dementia care. Nurs Older People. Feb 2001;12(10):17-19. *Not eligible target population.*
290. Avigne J, McHugh N, Manley M, Sievers L. OR roundtable. Managers' advice on OR staffing. OR Manager. Jun 1999;15(6):15-17, 19. *Interview*.
291. Baarda S. Caring for staff nurses. AWHONN Lifelines. Aug-Sep 2001;5(4):10-11. *Letter*.
292. Babus V. Tuberculosis morbidity risk in medical nurses in specialized institutions for the treatment of lung diseases in Zagreb. Int J Tuberc Lung Dis. Jun 1997;1(3):254-258. *Not eligible target population.*
293. Badovinac CC, Wilson S, Woodhouse D. The use of unlicensed assistive personnel and selected outcome indications. Nurs Econ. Jul-Aug 1999;17(4):194-200. *Not eligible exposure.*
294. Baggot DM, Hensinger B, Parry J, Valdes MS, Zaim S. The new hire/preceptor experience: cost-benefit analysis of one retention strategy. J Nurs Adm. Mar 2005;35(3):138-145. *Not eligible exposure.*
295. Bailey BA. How to float safely and effectively. Nursing. Feb 1990;20(2):113-116. *No association tested.*
296. Bailey DA, Mion LC. Improving care givers' satisfaction with information received during hospitalization. J Nurs Adm. Jan 1997;27(1):21-27. *Not eligible exposure.*
297. Bailey F. A day in the life: a night to remember. Nurs Stand. Nov 1-6 1995;10(6):38. *Case reports.*
298. Bailey L. Medical errors--what we can do? One informed patient's recommendations. S C Nurse. Oct-Dec 2002;9(4):20. *Comment.*
299. Bailey M. Occupational HIV infection risk. Lancet. May 5 1990;335(8697):1104-1105. *Comment*.
300. Bair B, Toth W, Johnson MA, Rosenberg C, Hurdle JF. Interventions for disruptive behaviors. Use and success. J Gerontol Nurs. Jan 1999;25(1):13-21. *Not eligible exposure.*
301. Bair N, Bobek MB, Hoffman-Hogg L, Mion LC, Slomka J, Arroliga AC. Introduction of sedative, analgesic, and neuromuscular blocking agent guidelines in a medical intensive care unit: physician and nurse adherence. Crit Care Med. Mar 2000;28(3):707-713. *Not eligible exposure.*

302. Baker H, Naphthine R. Nurses and medication. Part 6. Ritual+workloads = medication error. Aust Nurs J. Nov 1994;2(5):34-36. *Not eligible target population.*
303. Baker H, Naphthine R. Nurses and medication. Part 5. Medication error: the big stick to beat you with. Aust Nurs J. Oct 1994;2(4):28-30. *Not eligible target population.*
304. Baker HM. Rules outside the rules for administration of medication: a study in New South Wales, Australia. Image J Nurs Sch. 1997;29(2):155-158. *Not eligible target population.*
305. Baker K, Evans CB, Tiburzi T, Nolan MT, Frost GL, Kokoski P, Arrington DM. Costing services: comparing three i.v. medication systems. Nurs Manage. Mar 1993;24(3):56-60. *Not eligible exposure.*
306. Balas MC, Scott LD, Rogers AE. The prevalence and nature of errors and near errors reported by hospital staff nurses. Appl Nurs Res. Nov 2004;17(4):224-230. *Not eligible outcomes.*
307. Bale S, Tebbie N, Price P. A topical metronidazole gel used to treat malodorous wounds. Br J Nurs. Jun 10 2004;13(11):S4-11. *Not eligible target population.*
308. Balhorn J. Patient classification used as a tool for assessment of staff/patient ratios. Edtna Erca J. Jan-Mar 1998;24(1):13-16. *Review*.
309. Ball C, Walker G, Harper P, Sanders D, McElligott M. Moving on from 'patient dependency' and 'nursing workload' to managing risk in critical care. Intensive Crit Care Nurs. Apr 2004;20(2):62-68. *Not eligible target population.*
310. Balling K, McCubbin M. Hospitalized children with chronic illness: parental caregiving needs and valuing parental expertise. J Pediatr Nurs. Apr 2001;16(2):110-119. *Not eligible exposure.*
311. Ballweg DD. Implementing developmentally supportive family-centered care in the newborn intensive care unit as a quality improvement initiative. J Perinat Neonatal Nurs. Dec 2001;15(3):58-73. *Not eligible exposure.*
312. Bamber M. Reasons for leaving among psychiatric nurses: a two-year prospective study. Nurs Pract. 1991;4(4):9-11. *Not eligible exposure.*
313. Bania K, Bergmooser G. A tool for improving supplemental staffing. Nurs Manage. May 1997;28(5):78. *Comment*.
314. Banks N, Hardy B, Meskimen K. Take the plunge: expanding the float pool to "closed" units. Nurs Manage. Jan 1999;30(1):51-55. *Not eligible outcomes.*
315. Barash PG, Rosenbaum SH. Staffing ICUs: the good news and the not-so-good news. Chest. Mar 1998;113(3):569-570. *Comment.*
316. Barker P. Psychiatric caring. Nurs Times. Mar 8-14 2001;97(10):38-39. *Not eligible target population.*
317. Barnes J. A life in the day of. Nurs Stand. Nov 24-30 1999;14(10):26-27. *Comment.*
318. Barratt E. Investigating shift preferences. Nurs Times. May 8-14 1991;87(19):44-45. *Comment.*
319. Barrington SF, Kettle AG, O'Doherty MJ, Wells CP, Somer EJ, Coakley AJ. Radiation dose rates from patients receiving iodine-131 therapy for carcinoma of the thyroid. Eur J Nucl Med. Feb 1996;23(2):123-130. *Not eligible target population.*
320. Barta SK, Stacy RD. The effects of a theory-based training program on nurses' self-efficacy and behavior for smoking cessation counseling. J Contin Educ Nurs. May-Jun 2005;36(3):117-123. *Not eligible exposure.*
321. Barton E. Workwise: a job problem shared. Nurs Stand. May 26-Jun 1 1993;7(36):44-45. *Comment.*
322. Barton J. Nursing shifts. Is flexible rostering helpful? Nurs Times. Feb 15-22 1995;91(7):32-33. *Not eligible target population.*
323. Barton J, Spelten ER, Smith LR, et al. A classification of nursing and midwifery shift systems. International journal of nursing studies Feb 1993;30(1):65-80. *Not relevant.*
324. Barton J, Spelten E, Totterdell P, Smith L, Folkard S. Is there an optimum number of night shifts? Relationship between sleep, health and well-being. Work Stress. Apr-Sep 1995;9(2-3):109-123. *Not eligible target population.*
325. Barton J, Spelten ER, Smith LR, Totterdell PA, Folkard S. A classification of nursing and midwifery shift systems. Int J Nurs Stud. Feb 1993;30(1):65-80. *Not eligible target population.*
326. Bartram T, Joiner TA, Stanton P. Factors affecting the job stress and job satisfaction of Australian nurses: implications for recruitment and retention. Contemp Nurse. Oct 2004;17(3):293-304. *Not eligible target population.*
327. Barzoloski-O'Connor B. Have license, will travel. Nurs Spectr (Wash D C). Jul 29 1996;6(16):16. *Comment.*
328. Bassett D, Tsourtos G. Inpatient suicide in a general hospital psychiatric unit. A consequence of inadequate resources? Gen Hosp Psychiatry. Sep 1993;15(5):301-306. *Not eligible target population.*
329. Batalis NI, Prahlow JA. Accidental insulin overdose. J Forensic Sci. Sep 2004;49(5):1117-1120. *Case reports.*
330. Bates E. Part-time working. Defective agency. Nurs Times. Feb 28-Mar 5 1996;92(9):32-33. *Comment.*
331. Bates J. One day it could be you. Nurs Stand. Jun 2-8 2004;18(38):24-25. *Comment.*
332. Bauer I. Nurses' perception of the first hour of the morning shift (6.00-7.00 a.m.) in a German hospital. J Adv Nurs. Jun 1993;18(6):932-937. *Not eligible target population.*
333. Baulcomb JS. Management of change through force field analysis. J Nurs Manag. Jul 2003;11(4):275-280. *Not eligible target population.*
334. Baxter B. Operating department staffing--a business manager's perspective. Br J Theatre Nurs. Oct 1997;7(7):11, 14-17. *Not eligible target population.*
335. Baxter B. Have I been here before? Br J Theatre Nurs. Oct 1998;8(7):41-42. *Not eligible target population.*

336. Beach SM, Engelsher J, Kinzeler EE. Databits. Hey, that's my grandma! Ky Nurse. Oct-Dec 2004;52(4):7. *Comment*.
337. Beard EL, Jr. Stop floating--the next paradigm shift? J Nurs Adm. Mar 1994;24(3):4. *Comment*.
338. Beardsley D. Board of Nursing decision puts patients at risk. J Nurs Adm. Apr 1999;29(4):4-5. *Letter*.
339. Beasley T, Gerbis P, Lyon J. Staffing and critical care. Nev Rnformation. Jun 1995;4(2):7. *Comment*.
340. Beattie J, Calpin-Davies PJ. Workforce dilemmas: a comparison of staffing in a generalist and a specialist intensive care unit. Intensive Crit Care Nurs. Feb 1999;15(1):52-57. *Not eligible target population.*
341. Bechel DL, Myers WA, Smith DG. Does patient-centered care pay off? Jt Comm J Qual Improv. Jul 2000;26(7):400-409. *Not eligible exposure.*
342. Beck KL, Larrabee JH. Measuring patients' perceptions of nursing care. Nurs Manage. Sep 1996;27(9):32B-D. *Not eligible exposure.*
343. Becker A, Schulten-Oberborsch G, Beck U, Vestweber KH. Stoma care nurses: good value for money? World J Surg. Jul 1999;23(7):638-642; discussion 642-633. *Not eligible target population.*
344. Becker B, Woolard R, Nirenberg TD, Minugh A, Longabaugh R, Clifford PR. Alcohol use among subcritically injured emergency department patients. Acad Emerg Med. Sep 1995;2(9):784-790. *Not eligible outcomes.*
345. Becker ER, Foster RW. Organizational determinants of nurse staffing patterns. Nurs Econ. Mar-Apr 1988;6(2):71-75. *Not eligible year*.
346. Bednar B, McMullen N. A retrospective analysis of employee turnover in the health care setting. Nephrol News Issues. Feb 1998;12(2):35-39. *No association tested.*
347. Bednar B, Sinitzky M, Thrall K, Wick G. Staff turnover in the dialysis unit. Interview by Diane Boudreau. Nephrol News Issues. Sep 1995;9(9):39-40. *No association tested.*
348. Beeman J, Diehl B. A credentialing program for nursing staff caring for pediatric patients with an ilizarov apparatus. Rehabil Nurs. Sep-Oct 1995;20(5):278-282. *Not eligible exposure.*
349. Beer HL, Duvvi S, Webb CJ, Tandon S. Blood loss estimation in epistaxis scenarios. J Laryngol Otol. Jan 2005;119(1):16-18. *Not eligible exposure.*
350. Begley CM. 'Knowing your place': student midwives' views of relationships in midwifery in Ireland. Midwifery. Sep 2001;17(3):222-233. *Not eligible target population.*
351. Begley CM. 'Great fleas have little fleas': Irish student midwives' views of the hierarchy in midwifery. J Adv Nurs. May 2002;38(3):310-317. *Not eligible target population.*
352. Behrman AJ, Shofer FS, Green-McKenzie J. Trends in bloodborne pathogen exposure and follow-up at an urban teaching hospital: 1987 to 1997. J Occup Environ Med. Apr 2001;43(4):370-376. *Not eligible exposure.*
353. Beitz JM, Fey J, O'Brien D. Perceived need for education vs. actual knowledge of pressure ulcer care in a hospital nursing staff. Medsurg Nurs. Oct 1998;7(5):293-301. *Not eligible exposure.*
354. Belcher JV, Munjas B. Psychiatric-mental health head nurse management concerns. Arch Psychiatr Nurs. Aug 1990;4(4):260-263. *No association tested.*
355. Bell M, Warner JA, Cameron AE. Patient flow patterns in a recovery room and implications for staffing. J R Soc Med. Jan 1985;78(1):35-38. *Not eligible year.*
356. Beltzhoover M. Self-scheduling: an innovative approach. Nurs Manage. Apr 1994;25(4):81-82. *No association tested.*
357. Ben-Ami S, Shaham J, Rabin S, Melzer A, Ribak J. The influence of nurses' knowledge, attitudes, and health beliefs on their safe behavior with cytotoxic drugs in Israel. Cancer Nurs. Jun 2001;24(3):192-200. *Not eligible target population.*
358. Benjamin I. Staff allocation and rostering in a Queensland public hospital. Qld Nurse. Nov-Dec 1990;9(6):10-11. *No association tested.*
359. Benko LB. Oregon passes nurses bill. Hospitals and nurses at odds over potential effect on staffing. Mod Healthc. Jun 18 2001;31(25):52. *News*.
360. Benko LB. Workforce report 2003. Ratio daze in California. State staffing law may exacerbate nursing shortfall. Mod Healthc. Jun 16 2003;33(24):30-31. *Comment*.
361. Bennett DS. The blind men and the elephant. A fable for health care safety. Crit Care Nurs Clin North Am. Dec 2002;14(4):xiii-xvi. *Comment*.
362. Bennett DS, Dune L. Everyday thoughts: harnessing the thought process toward a practical framework for increasing critical thinking and reducing error. Crit Care Nurs Clin North Am. Dec 2002;14(4):385-390, viii-ix. *Review*.
363. Benson RM. A non-specialist's guide to the CCU. Rn. Jan 1991;54(1):50-53. *Comment*.
364. Berden HJ, Willems FF, Hendrick JM, Pijls NH, Knape JT. How frequently should basic cardiopulmonary resuscitation training be repeated to maintain adequate skills? Bmj. Jun 12 1993;306(6892):1576-1577. *Not eligible target population.*
365. Bergbom I, Svensson C, Berggren E, Kamsula M. Patients' and relatives' opinions and feelings about diaries kept by nurses in an intensive care unit: pilot study. Intensive Crit Care Nurs. Aug 1999;15(4):185-191. *Not eligible target population.*
366. Berger MC, Seversen A, Chvatal R. Ethical issues in nursing. West J Nurs Res. Aug 1991;13(4):514-521. *Not eligible outcomes.*
367. Berglin P. Leadership through shared governance. Colo Nurse. Mar 1995;95(1):19-20. *Comment*.
368. Berland A. Controlling workload. Can Nurse. May 1990;86(5):36-38. *No association tested.*
369. Berliner H. US healthcare. United straits. Health Serv J. Jun 27 2002;112(5811):32. *Comment*.
370. Berman S. Health care: mandatory nurse-to-patient staffing ratios in California. J Law Med Ethics. Summer 2002;30(2):312-313. *Review*.

371. Berrios CD, Jacobowitz WH. Therapeutic holding: outcomes of a pilot study. J Psychosoc Nurs Ment Health Serv. Aug 1998;36(8):14-18. *Not eligible exposure.*
372. Berry D, Drury J, Prendeville B, Ranganathan P, Sumner J. Sexual abuse: giving support to nurses. Nurs Stand. Oct 13-19 1993;8(4):25-27. *Not eligible target population.*
373. Berry DM. An inpatient classification system for nursing service staffing decisions. Commun Nurs Res. Mar 1977;8:90-100. *Not eligible year.*
374. Bertolini G, Rossi C, Brazzi L, Radrizzani D, Rossi G, Arrighi E, Simini B. The relationship between labour cost per patient and the size of intensive care units: a multicentre prospective study. Intensive Care Med. Dec 2003;29(12):2307-2311. *Not eligible target population.*
375. Bertram DA, Thompson MC, Giordano D, Perla J, Rosenthal TC. Implementation of an inpatient case management program in rural hospitals. J Rural Health. Winter 1996;12(1):54-66. *Not eligible exposure.*
376. Bethel S, Ridder J. Evaluating nursing practice: satisfaction at what cost? Nurs Manage. Sep 1994;25(9):41-43, 46-48. *Not eligible outcomes.*
377. Bevan J, Linton A. Continuous quality improvement: maintaining quality of care with changing staffing patterns. J Cannt. Spring 1998;8(2):33-35. *No association tested.*
378. Beyea SC. Too tired to work safely? Aorn J. Sep 2004;80(3):559-562. *Not eligible exposure.*
379. Beyers M. Ask AONE's experts ... about staffing options. Nurs Manage. Jul 1998;29(7):72. *Comment*.
380. Beyers M. Ask AONE's experts ... about patient-focused care. Nurs Manage. Aug 1998;29(8):88. *Comment*.
381. Beyers M. Ask AONE's experts ... about how to reduce overtime and use of per diem staff. Nurs Manage. Dec 1999;30(12):56. *Comment*.
382. Beyers M. Ask AONE's experts ... about counting short-stay census. Nurs Manage. May 1999;30(5):72. *Comment*.
383. Bhatia R, Blackshaw G, Rogers A, Grant A, Kulkarni R. Developing a departmental culture for reporting adverse incidents. Int J Health Care Qual Assur Inc Leadersh Health Serv. 2003;16(2-3):154-156. *Not eligible target population.*
384. Bhengu BR. Exploring the critical care nurses' experiences regarding moonlighting. Curationis. May 2001;24(2):48-53. *Not eligible target population.*
385. Biddle J. 9 tips for success. Nursing. Nov 2002;32(11 Pt 1):80. *Comment*.
386. Bilchik GS. Norma Rae, R.N. Hosp Health Netw. Nov 2000;74(11):40-44. *Comment*.
387. Biller AM. Implementing nursing case management. Rehabil Nurs. May-Jun 1992;17(3):144-146. *No association tested.*
388. Billinghurst F, Morgan B, Arthur HM. Patient and nurse-related implications of remote cardiac telemetry. Clin Nurs Res. Nov 2003;12(4):356-370. *Not eligible exposure.*
389. Binder RL, McNiel DE. Staff gender and risk of assault on doctors and nurses. Bull Am Acad Psychiatry Law. 1994;22(4):545-550. *Not eligible exposure.*
390. Bingham R. Leaving nursing. Health Aff (Millwood). Jan-Feb 2002;21(1):211-217. *Comment*.
391. Binnekade JM, Vroom MB, de Mol BA, de Haan RJ. The quality of Intensive Care nursing before, during, and after the introduction of nurses without ICU-training. Heart Lung. May-Jun 2003;32(3):190-196. *Not eligible target population.*
392. Binnie A. Freedom to practise: patient-centred nursing. Nurs Times. Jan 27-Feb 2 2000;96(4):39-40. *Comment.*
393. Birnbaum D. Full-time equivalent (FTE) numbers. Infect Control Hosp Epidemiol. Mar 2002;23(3):116-117. *Comment*.
394. Bischof J. Self-scheduling in critical care. Crit Care Nurse. Jan 1992;12(1):50-55. *No association tested.*
395. Bishop S, Panjari M, Astbury J, Bell R. "A survey of antenatal clinic staff: some perceived barriers to the promotion of smoking cessation in pregnancy". Aust Coll Midwives Inc J. Sep 1998;11(3):14-18. *Not eligible target population.*
396. Bissonnette T. What was said, what we heard. Mich Nurse. Jun-Jul 2005;78(5):10. *Comment*.
397. Bjork IT. Practical skill development in new nurses. Nurs Inq. Mar 1999;6(1):34-47. *Not eligible target population.*
398. Bjork IT, Kirkevold M. Issues in nurses' practical skill development in the clinical setting. J Nurs Care Qual. Oct 1999;14(1):72-84. *Not eligible target population.*
399. Black K. Specialized teams complement nursing. Patient satisfaction begins with satisfied professional and support teams. Healthc Exec. Mar-Apr 2004;19(2):50-51. *Comment.*
400. Blain S. Attitudes to women undergoing TOP. Nurs Stand. Jun 2-8 1993;7(37):30-33. *Not eligible exposure.*
401. Blair PD. Continuous assessment and regular communication foster patient safety. Nurs Manage. Aug 2003;34(8):22-23, 60. *Comment*.
402. Blanchfield KC, Biordi DL. Power in practice: a study of nursing authority and autonomy. Nursing administration quarterly Spring 1996;20(3):42-9. *Not relevant.*
403. Bland P. New grads face changing employment picture -- a synopsis of a 1996 survey. Nurse to Nurse Jan-Feb 1997;8(1):14-5. *Not peer reviewed.*
404. Blank AE, Horowitz S, Matza D. Quality with a human face? The Samuels Planetree model hospital unit. Jt Comm J Qual Improv. Jun 1995;21(6):289-299. *Not eligible exposure.*
405. Blegen MA, Vaughn T, Pepper G, Vojir C, Stratton K, Boyd M, Armstrong G. Patient and staff safety: voluntary reporting. Am J Med Qual. Mar-Apr 2004;19(2):67-74. *Not eligible exposure.*
406. Blewitt DK, Jones KR. Using elements of the nursing minimum data set for determining outcomes. J Nurs Adm. Jun 1996;26(6):48-56. *Not eligible exposure.*

407. Bliss-Holtz J. Discriminating types of medication calculation errors in nursing practice. Nurs Res. Nov-Dec 1994;43(6):373-375. *Not eligible outcomes.*
408. Bloice C. Slash and burn redux. Hunter Group still bottom-line feeding. Revolution. May-Jun 2002;3(3):6-7. *News*.
409. Bloodworth C, Lea A, Lane S, Ginn R. Challenging the myth of the 12-hour shift: a pilot evaluation. Nurs Stand. Apr 4-10 2001;15(29):33-36. *Not eligible target population.*
410. Blumenfield M, Milazzo J, Wormser GP, Smith PJ. Reluctance to care for patients with AIDS. Gen Hosp Psychiatry. Nov 1991;13(6):410. *Letter*.
411. Blythe J, Baumann A, Zeytinoglu I, Denton M, Higgins A. Full-time or part-time work in nursing: preferences, tradeoffs and choices. Healthc Q. 2005;8(3):69-77, 64. *Not eligible outcomes.*
412. Boehm C. PASNAP targets mandatory overtime. Revolution. May-Jun 2005;6(3):11. *Comment*.
413. Boettger JE. Effects of a pressure-reduction mattress and staff education on the incidence of nosocomial pressure ulcers. J Wound Ostomy Continence Nurs. Jan 1997;24(1):19-25. *Not eligible exposure*
414. Bohnen MV, Balantac DD. Basic academic preparation of foreign-educated nurses: a base for developing continuing education courses. Journal of continuing education in nursing Nov-Dec 1994;25(6):258-62. *Not relevant.*.
415. Boling J, Hoffmann L. The nursing shortage and its implications for case management. Case Manager. Nov-Dec 2001;12(6):53-57. *No association tested.*
416. Bolton SC. Who cares? Offering emotion work as a 'gift' in the nursing labour process. J Adv Nurs. Sep 2000;32(3):580-586. *Not eligible exposure.*
417. Bonadio WA, Carney M, Gustafson D. Efficacy of nurses suturing pediatric dermal lacerations in an emergency department. Ann Emerg Med. Dec 1994;24(6):1144-1146. *Not eligible exposure.*
418. Bond CA, Raehl CL, Franke T. Medication errors in United States hospitals. Pharmacotherapy. Sep 2001;21(9):1023-1036. *Not eligible outcomes.*
419. Bond CA, Raehl CL, Franke T. Interrelationships among mortality rates, drug costs, total cost of care, and length of stay in United States hospitals: summary and recommendations for clinical pharmacy services and staffing. Pharmacotherapy. Feb 2001;21(2):129-141. *Not eligible exposure.*
420. Bond CA, Raehl CL, Franke T. Clinical pharmacy services, hospital pharmacy staffing, and medication errors in United States hospitals. Pharmacotherapy. Feb 2002;22(2):134-147. *Not eligible exposure.*
421. Bond CA, Raehl CL, Pitterle ME. Staffing and the cost of clinical and hospital pharmacy services in United States hospitals. Pharmacotherapy. Jun 1999;19(6):767-781. *Not eligible exposure.*
422. Bond GE, Fiedler FE. A comparison of leadership vs. renovation in changing staff values. Nurs Econ. Jan-Feb 1999;17(1):37-43. *Not eligible exposure.*
423. Bondas TE. Caritative leadership. Ministering to the patients. Nurs Adm Q. Jul-Sep 2003;27(3):249-253. *Review*.
424. Bonner R, Beaumont R, Smith B. Understanding rostering. Part 6. Changing rosters--managing roster change. Aust Nurs J. Aug 1995;3(2):36-38. *Not eligible target population.*
425. Bonner R, Beaumont R, Smith B. Understanding rostering. Part 4. Products & consequences. Aust Nurs J. Jun 1995;2(11):36-38. *Not eligible target population.*
426. Bonner R, Beaumont R, Smith B. Understanding rostering. Part 3. How a roster is developed. Aust Nurs J. May 1995;2(10):40-42. *Not eligible target population.*
427. Bonner R, Beaumont R, Smith B. Understanding rostering. Part 1. The rights & wrongs of rostering. Aust Nurs J. Mar 1995;2(8):18-20. *Not eligible target population.*
428. Booker JM, Roseman C. A seasonal pattern of hospital medication errors in Alaska. Psychiatry Res. Aug 28 1995;57(3):251-257. *Not eligible exposure.*
429. Boomer MJ, Rissel C. An evaluation of a smoke free environment policy in two Sydney hospitals. Aust Health Rev. 2002;25(3):179-184. *Not eligible target population.*
430. Boosfeld B. Conflict in decision making: do nurses have a role? Paediatr Nurs. Sep 1995;7(7):21-23. *Comment*.
431. Booth B. Management of drug errors. Nurs Times. Apr 13-19 1994;90(15):30-31. *Comment*.
432. Borg E. Professional liability during the shortage. Can Nurse. Sep 2001;97(8):34-35. *Comment*.
433. Borg MA. Bed occupancy and overcrowding as determinant factors in the incidence of MRSA infections within general ward settings. J Hosp Infect. Aug 2003;54(4):316-318. *Not eligible target population.*
434. Borromeo AR, Windle PE, Eagen MK. The professional salary model: meeting the bottom lines. Nurs Econ. Jul-Aug 1996;14(4):241-244. *No association tested.*
435. Boscarino JA. Patients' perception of quality hospital care and hospital occupancy: are there biases associated with assessing quality care based on patients' perceptions? Int J Qual Health Care. Oct 1996;8(5):467-477. *Not eligible outcomes.*
436. Bosek MS. Mandatory overtime: professional duty, harms, and justice. JONAS Healthc Law Ethics Regul. Dec 2001;3(4):99-102. *Comment*.
437. Bosman RJ, Rood E, Oudemans-van Straaten HM, Van der Spoel JI, Wester JP, Zandstra DF. Intensive care information system reduces documentation time of the nurses after cardiothoracic surgery. Intensive Care Med. Jan 2003;29(1):83-90. *Not eligible target population.*
438. Bostrom J, Tisnado J, Zimmerman J, Lazar N. The impact of continuity of nursing care personnel on patient satisfaction. J Nurs Adm. Oct 1994;24(10):64-68. *Not eligible exposure.*
439. Bostrom J, Zimmerman J. Restructuring nursing for a competitive health care environment. Nurs Econ. Jan-Feb 1993;11(1):35-41, 54. *Not eligible outcomes.*

440. Bostrom JM. Impact of physician practice on nursing care. Nurs Econ. Sep-Oct 1994;12(5):250-255, 286. *Not eligible exposure.*
441. Boudreaux ED, Ary R, Mandry C. Emergency department personnel accuracy at estimating patient satisfaction. J Emerg Med. Aug 2000;19(2):107-112. *Not eligible exposure.*
442. Boumans NP, Landeweerd JA, Visser M. Differentiated practice, patient-oriented care and quality of work in a hospital in the Netherlands. Scand J Caring Sci. Mar 2004;18(1):37-48. *Not eligible target population.*
443. Bourbonnais R, Comeau M, Vezina M. Job strain and evolution of mental health among nurses. J Occup Health Psychol. Apr 1999;4(2):95-107. *Not eligible outcomes.*
444. Bourbonnais R, Vinet A, Vezina M, Gingras S. Certified sick leave as a non-specific morbidity indicator: a case-referent study among nurses. Br J Ind Med. Oct 1992;49(10):673-678. *Not eligible outcomes.*
445. Bourgault AM, Smith S. The development of multi-level critical care competency statements for self-assessment by ICU nurses. Dynamics. Winter 2004;15(4):15-18. *Not eligible exposure.*
446. Bouza E, Munoz P, Lopez-Rodriguez J, Jesus Perez M, Rincon C, Martin Rabadan P, Sanchez C, Bastida E. A needleless closed system device (CLAVE) protects from intravascular catheter tip and hub colonization: a prospective randomized study. J Hosp Infect. Aug 2003;54(4):279-287. *Not eligible exposure.*
447. Bowden FJ, Pollett B, Birrell F, Dax EM. Occupational exposure to the human immunodeficiency virus and other blood-borne pathogens. A six-year prospective study. Med J Aust. Jun 21 1993;158(12):810-812. *Not eligible exposure.*
448. Bowles C, Candela L. First job experiences of recent RN graduates: improving the work environment. J Nurs Adm. Mar 2005;35(3):130-137. *Not eligible outcomes.*
449. Bowles KH. Application of the Omaha System in acute care. Res Nurs Health. Apr 2000;23(2):93-105. *Not eligible exposure.*
450. Boyd G. Terminated. Radiol Manage. Jan-Feb 2004;26(1):54. *Review*.
451. Boykin A, Schoenhofer SO, Smith N, St Jean J, Aleman D. Transforming practice using a caring-based nursing model. Nurs Adm Q. Jul-Sep 2003;27(3):223-230. *Not eligible exposure.*
452. Boynton D, Rothman L. Stage managing change: supporting new patient care models. Nurs Econ. May-Jun 1995;13(3):166-173. *No association tested.*
453. Braddy PK, Washburn TA, Carroll LL. Factors influencing nurses to work for agencies. Western journal of nursing research Jun 1991;13(3):353-62. *Not relevant.*
454. Bradley CF, Kozak C. Nursing care and management of the elderly hip fractured patient. J Gerontol Nurs. Aug 1995;21(8):15-22. *Not eligible exposure.*
455. Bradley D. Ask the experts. Crit Care Nurse. Apr 1998;18(2):98-99. *Comment*.
456. Bradley EH, Cherlin E, McCorkle R, Fried TR, Kasl SV, Cicchetti DV, Johnson-Hurzeler R, Horwitz SM. Nurses' use of palliative care practices in the acute care setting. J Prof Nurs. Jan-Feb 2001;17(1):14-22. *Not eligible outcomes.*
457. Bradley G. Drug errors. Just one slip. Interview by Daloni Carlisle. Nurs Times. Apr 3-9 1991;87(14):30-31. *Interview*.
458. Bradley S. Suffer the little children. The influence of nurses and parents in the evolution of open visiting in children's wards 1940-1970. Int Hist Nurs J. 2001;6(2):44-51. *Not eligible target population.*
459. Brady J. The nursing life. Stolen bases. Am J Nurs. Apr 1994;94(4):51. *Comment*.
460. Bratt MM, Broome M, Kelber S, Lostocco L. Influence of stress and nursing leadership on job satisfaction of pediatric intensive care unit nurses. Am J Crit Care. Sep 2000;9(5):307-317. *Not eligible exposure.*
461. Braun BI, Kritchevsky SB, Wong ES, Solomon SL, Steele L, Richards CL, Simmons BP. Preventing central venous catheter-associated primary bloodstream infections: characteristics of practices among hospitals participating in the Evaluation of Processes and Indicators in Infection Control (EPIC) study. Infect Control Hosp Epidemiol. Dec 2003;24(12):926-935. *No association tested.*
462. Bremnes RM. Experience with and attitudes to chemotherapy among newly employed nurses in oncological and surgical departments: a longitudinal study. Support Care Cancer. Jan 1999;7(1):11-16. *Not eligible target population.*
463. Brennan W, Scully W, Tarbuck P, Young C. Nurses' attire in a special hospital: perceptions of patients and staff. Nurs Stand. Apr 26-May 2 1995;9(31):35-38. *Not eligible exposure.*
464. Breslawski S, Hamilton D. Operating room scheduling. Choosing the best system. Aorn J. May 1991;53(5):1229-1237. *Not eligible outcomes.*
465. Brewer CS, Nauenberg E. Future intentions of registered nurses employed in the western New York labor market: relationships among demographic, economic, and attitudinal factors. Applied Nursing Research Aug 2003;16(3):144-55. *Not relevant.*
466. Brewer CS, Zayas LE, Kahn LS, et al. Nursing recruitment and retention in New York State: a qualitative workforce needs assessment. Policy, Politics, & Nursing Practice Feb 2006;7(1):54-63. *Not relevant.*
467. Brezynskie H, Pendon E, Lindsay P, Adam M. Identification of the perceived learning needs of balloon angioplasty patients. Can J Cardiovasc Nurs. 1998;9(2):8-14. *Not eligible exposure.*
468. Bridgeman J. How do nurses learn about family-centred care? Paediatr Nurs. May 1999;11(4):26-29. *Not eligible target population.*
469. Bridger JC. A study of nurses' views about the prevention of nosocomial urinary tract infections. Journal of clinical nursing Sep 1997;6(5):379-87. *Not relevant.*
470. Briggs B. Pumped up about i.v. system. Health Data Manag. Feb 2004;12(2):106-108, 110. *Comment*.

471. Brillhart B, Sills F. Analysis of the roles and responsibilities of rehabilitation nursing staff. Rehabilitation Nursing May-Jun 1994;19(3):145-50, 90. *Not relevant.*
472. Brillman JC, Doezema D, Tandberg D, Sklar DP, Davis KD, Simms S, Skipper BJ. Triage: limitations in predicting need for emergent care and hospital admission. Ann Emerg Med. Apr 1996;27(4):493-500. *Not eligible exposure.*
473. Brockopp DY, Franey BN, Sage-Smith D, Romond EH, Cannon CC. Patients' knowledge of their caregivers' names. A teaching-hospital study. Hosp Top. Winter 1992;70(1):25-28. *Not eligible exposure.*
474. Brockopp DY, Porter M, Kinnaird S, Silberman S. Fiscal and clinical evaluation of patient care. A case management model for the future. J Nurs Adm. Sep 1992;22(9):23-27. *Not eligible exposure.*
475. Brodell E. Nursing career satisfaction: the effects of autonomy, social integration and flexible scheduling. Prairie Rose. Sep-Nov 1996;65(3):4-6. *No association tested.*
476. Broekmans S, Vanderschueren S, Morlion B, Kumar A, Evers G. Nurses' attitudes toward pain treatment with opioids: a survey in a Belgian university hospital. Int J Nurs Stud. Feb 2004;41(2):183-189. *Not eligible target population.*
477. Brogan G. Off and running! Revolution. Jan-Feb 2004;5(1):18-21. *Not eligible target population.*
478. Brokalaki H, Matziou V, Zyga S, Kapella M, Tsaras K, Brokalaki E, Myrianthefs P. Omissions and errors during oxygen therapy of hospitalized patients in a large city of Greece. Intensive Crit Care Nurs. Dec 2004;20(6):352-357. *Not eligible target population.*
479. Bronder E. A decision that defies logic. Am J Nurs. Apr 2001;101(4):57-58. *Comment*.
480. Brooks I. The lights are bright? Debating the future of the permanent night shift. J Manag Med. 1997;11(2-3):58-70. *Not eligible target population.*
481. Broomfield D, Humphris GM, Fisher SE, Vaughan D, Brown JS, Lane S. The orofacial cancer patient's support from the general practitioner, hospital teams, family, and friends. J Cancer Educ. Winter 1997;12(4):229-232. *Not eligible target population.*
482. Brotherton JM, Bartlett MJ, Muscatello DJ, Campbell-Lloyd S, Stewart K, McAnulty JM. Do we practice what we preach? Health care worker screening and vaccination. Am J Infect Control. May 2003;31(3):144-150. *Not eligible target population.*
483. Brous E. How to handle that staffing predicament. Rn. May 2002;65(5):67-70. *Comment*.
484. Brown B. How to develop a unit personnel budget. Nurs Manage. Jun 1999;30(6):34-35. *No association tested.*
485. Brown B. Formula for an effective acuity system. Nurs Manage. Jun 1999;30(6):14. *Comment*.
486. Brown C, Arnetz B, Petersson O. Downsizing within a hospital: cutting care or just costs? Soc Sci Med. Nov 2003;57(9):1539-1546. *Not eligible target population.*
487. Brown G. Nursing is critically ill: why? What can be done to help alleviate the nursing shortage. Minor Nurse Newsl. Winter 2003;10(1):2. *Comment*.
488. Brown H. Media frenzy follows diary publication. Nurs N Z. Aug 1996;2(7):7. *News.*
489. Brown H. Nightmare on night shift. Nurs N Z. Jul 1996;2(6):20. *Comment*.
490. Brown PW, Fay MS. Sentinel event review, Part II: A new spirit of inquiry. Aspens Advis Nurse Exec. Oct 1997;13(1):1, 5-6. *Comment.*
491. Browne R, Miller E. Leading your leader. Nurs Manage. Oct 2003;34(10):58-62. *Not eligible exposure.*
492. Brownson K, Dowd SB. Floating: a nurse's nightmare? Health Care Superv. Mar 1997;15(3):10-15. *No association tested.*
493. Bruce J, Wong I. Parenteral drug administration errors by nursing staff on an acute medical admissions ward during day duty. Drug Saf. 2001;24(11):855-862. *Not eligible target population.*
494. Bruera E, Willey JS, Ewert-Flannagan PA, Cline MK, Kaur G, Shen L, Zhang T, Palmer JL. Pain intensity assessment by bedside nurses and palliative care consultants: a retrospective study. Support Care Cancer. Apr 2005;13(4):228-231. *Not eligible exposure.*
495. Brumfield VC, Kee CC, Johnson JY. Preoperative patient teaching in ambulatory surgery settings. Aorn J. Dec 1996;64(6):941-946, 948, 951-942. *Not eligible exposure.*
496. Bruner DW. Radiation oncology nurses: staffing patterns and role development. Oncol Nurs Forum. May 1993;20(4):651-655. *Review*.
497. Brunt BA. Continuing education evaluation of behavior change. J Nurses Staff Dev. Mar-Apr 2000;16(2):49-54. *Not eligible outcomes.*
498. Brusco MJ, Futch J, Showalter MJ. Nurse staff planning under conditions of a nursing shortage. J Nurs Adm. Jul-Aug 1993;23(7-8):58-64. *No association tested.*
499. Bryan YE, Hitchings KS, Fuss MA, Fox MA, Kinneman MT, Young MJ. Measuring and evaluating hospital restructuring efforts. Eighteen-month follow-up and extension to critical care, Part 1. J Nurs Adm. Sep 1998;28(9):21-27. *Not eligible exposure.*
500. Bryant C. Role clarification: a quality improvement survey of hospital chaplain customers. J Healthc Qual. Jul-Aug 1993;15(4):18-20. *Not eligible exposure.*
501. Bryant CJ, Crean SJ, Hopper C. Maxillofacial surgery and the role of the extended day case. Br Dent J. Feb 22 1997;182(4):134-138. *Not eligible target population.*
502. Bryden DC, Gwinnutt CL. Tracheal intubation via the laryngeal mask airway: a viable alternative to direct laryngoscopy for nursing staff during cardiopulmonary resuscitation. Resuscitation. Jan 1998;36(1):19-22. *Not eligible exposure.*
503. Buchan J. Shifting patterns of nurses' work. Nurs Stand. Jun 16-22 1993;7(39):29. *Comment*.
504. Buchan J. Lessons from America? US magnet hospitals and their implications for UK nursing. J Adv Nurs. Feb 1994;19(2):373-384. *Review*.
505. Buchan J. Shifting the patterns of nurses' work. Nurs Stand. Aug 2-8 1995;9(45):29. *Comment*.

506. Buchan J. The shape of time to come. Nurs Stand. Mar 22-28 1995;9(26):22-23. *Not eligible target population.*
507. Buchan J. Working on the bank: why do nurses do it? Nurs Stand. Mar 15-21 1995;9(25):33. *Not eligible target population.*
508. Buchan J. The quality of mercy. Nurs Stand. Jun 11 1997;11(38):22-23. *Not eligible target population.*
509. Buchan J. The cost of understaffing. Nurs Stand. May 21 1997;11(35):27. *Comment*.
510. Buchan J. Workforce planning. Your country needs you. Health Serv J. Jul 16 1998;108(5613):22-25. *Not eligible target population.*
511. Buchan J. Still attractive after all these years? Magnet hospitals in a changing health care environment. J Adv Nurs. Jul 1999;30(1):100-108. *Review*.
512. Buchan J. Rethink the weighting game. Nurs Stand. Aug 2-8 2000;14(46):23. *Comment*.
513. Buchan J. Recruitment. Happy landings? Health Serv J. Aug 24 2000;110(5719):24-27. *Not eligible target population.*
514. Buchman TG, Ray SE, Wax ML, Cassell J, Rich D, Niemczycki MA. Families' perceptions of surgical intensive care. J Am Coll Surg. Jun 2003;196(6):977-983. *Review*.
515. Bucknall TK. Critical care nurses' decision-making activities in the natural clinical setting. Journal of clinical nursing Jan 2000;9(1):25-36. *Not relevant.*
516. Buerhaus PI, Donelan K, Ulrich BT, Norman L, Dittus R. Is the shortage of hospital registered nurses getting better or worse? Findings from two recent national surveys of RNs. Nurs Econ. Mar-Apr *2005;23(2):61-71, 96, 55.* Not eligible outcomes.
517. Buerhaus PI, Staiger DO, Auerbach DI. New signs of a strengthening U.S. nurse labor market? Health affairs Jul-Dec 2004;23(Supplement 2):W4-526-33. *Not relevant.*
518. Buerhaus PI, Staiger DO, Auerbach DI. Implications of an Aging Registered Nurse Workforce. JAMA. June 14, 2000 2000;283(22):2948-2954. *Not eligible outcomes.*
519. Buerhaus PI, Staiger DO, Auerbach DI. Is the current shortage of hospital nurses ending? Health Aff (Millwood). Nov-Dec 2003;22(6):191-198. *Not eligible exposure.*
520. Buff DD, Shabti R. The night float system of resident on call: what do the nurses think? J Gen Intern Med. Jul 1995;10(7):400-402. *Not eligible exposure.*
521. Bull MJ. Patients' and professionals' perceptions of quality in discharge planning. J Nurs Care Qual. Jan 1994;8(2):47-61. *Not eligible exposure.*
522. Bupp JE, Dinger M, Lawrence C, Wingate S. Placement of cardiac electrodes: written, simulated, and actual accuracy. Am J Crit Care. Nov 1997;6(6):457-462. *Not eligible exposure.*
523. Burden B. Privacy or help? The use of curtain positioning strategies within the maternity ward environment as a means of achieving and maintaining privacy, or as a form of signalling to peers and professionals in an attempt to seek information or support. J Adv Nurs. Jan 1998;27(1):15-23. *Not eligible target population.*
524. Burek C, Collins NA, Hodlin A. An easy way to communicate pathways to patients. Hosp Food Nutr Focus. Jun 1996;12(10):4; suppl 1 p. *Comment*.
525. Burge J. Meet the travelers. Janis Burge. Rn. Jan 2004;Suppl:12. *Interview*.
526. Burgess L. Mixed-sex wards--the NT survey results. Nurs Times. Aug 3-9 1994;90(31):35-38. *Not eligible exposure.*
527. Burgess L. Mixed-sex wards. Mixed responses. Nurs Times. Jan 12-18 1994;90(2):30-34. *Not eligible exposure.*
528. Burhansstipanov L, Wound DB, Capelouto N, Goldfarb F, Harjo L, Hatathlie L, Vigil G, White M. Culturally relevant "Navigator" patient support. The Native sisters. Cancer Pract. May-Jun 1998;6(3):191-194. *No association tested.*
529. Burke RJ. Surviving hospital restructuring. Next steps. J Nurs Adm. Apr 2001;31(4):169-172. *Not eligible outcomes.*
530. Burke RJ. Work experiences and psychological well-being of former hospital-based nurses now employed elsewhere. Psychol Rep. Dec 2002;91(3 Pt 2):1059-1064. *Not eligible outcomes.*
531. Burke RJ. Survivors and victims of hospital restructuring and downsizing: who are the real victims? Int J Nurs Stud. Nov 2003;40(8):903-909. *Not eligible target population.*
532. Burke RJ. Hospital restructuring stressors: support and nursing staff perceptions of unit functioning. Health Care Manag (Frederick). Jul-Sep 2003;22(3):241-248. *Not eligible exposure.*
533. Burke RJ. Implementation of hospital restructuring and nursing staff perceptions of hospital functioning. J Health Organ Manag. 2004;18(4-5):279-289. *Not eligible outcomes.*
534. Burke RJ. Work status congruence, work outcomes, and psychologic well-being. Health Care Manag (Frederick). Apr-Jun 2004;23(2):120-127. *Not eligible outcomes.*
535. Burke RJ. Correlates of nursing staff survivor responses to hospital restructuring and downsizing. Health Care Manag (Frederick). Apr-Jun 2005;24(2):141-149. *Not eligible exposure.*
536. Burke RJ, Greenglass ER. Work-family congruence and work-family concerns among nursing staff. Can J Nurs Leadersh. May-Jun 1999;12(2):21-29. *Not eligible exposure.*
537. Burke RL. When bad things happen to good organizations: a focused approach to recovery using the essentials of magnetism. Nurs Adm Q. Jul-Sep 2005;29(3):228-240. *Review*.
538. Burkle NL. Using 'weekenders' to staff the OR. Aorn J. Sep 1990;52(3):632, 634, 636. *No association tested.*
539. Burke RJ, Greenglass ER. Juggling act: work concerns, family concerns. Canadian Nurse Oct 2000;96(9):20-3. *Inadequate date presentation.*
540. Burman ME. The impact of organizational and environmental factors on staffing in home health care. Public Health Nurs. Dec 1993;10(4):233-240. *Not eligible target population.*

541. Burnard P. Implications of client-centred counselling for nursing practice. Nurs Times. Jun 28-Jul 4 1995;91(26):35-37. *Comment*.
542. Burner OY, Cunningham P, Hattar HS. Managing a multicultural nurse staff in a multicultural environment. J Nurs Adm. Jun 1990;20(6):30-34. *Not eligible outcomes.*
543. Burns J. Soviet nurses help alleviate Baltimore hospital's shortage. Mod Healthc. Aug 19 1991;21(33):71, 73. *Not eligible outcomes.*
544. Burns JP, Mitchell C, Griffith JL, Truog RD. End-of-life care in the pediatric intensive care unit: attitudes and practices of pediatric critical care physicians and nurses. Crit Care Med. Mar 2001;29(3):658-664. *Not eligible outcomes.*
545. Burrows Z, O'Connor S. Let the team decide? Evaluation of self-rostering on an acute general medical ward. Prof Nurse. Nov 1993;9(2):86-90. *Not eligible target population.*
546. Busby A, Gilchrist B. The role of the nurse in the medical ward round. J Adv Nurs. Mar 1992;17(3):339-346. *Not eligible target population.*
547. Bushy A. Critical access hospitals: rural nursing issues. J Nurs Adm. Jun 2001;31(6):301-310. *Comment*.
548. Butler D, Oswald SL, Turner DE. The effects of demographics on determinants of perceived health-care service quality. The case of users and observers. J Manag Med. 1996;10(5):8-20. *Not eligible exposure.*
549. Butler L. Valuing research in clinical practice: a basis for developing a strategic plan for nursing research. Can J Nurs Res. Winter 1995;27(4):33-49. *Not eligible outcomes.*
550. Buttery J, Eades M, Frisch S, Giguere M, Mountjoy A. Family response to difficult hospitalizations: the phenomenon of 'working through'. J Clin Nurs. Jul 1999;8(4):459-466. *Not eligible exposure.*
551. Byrd ME. Child-focused single home visiting. Public Health Nurs. Oct 1997;14(5):313-322. *Not eligible exposure.*
552. Byrne G, Richardson M, Brunsdon J, Patel A. Patient satisfaction with emergency nurse practitioners in A & E. J Clin Nurs. Jan 2000;9(1):83-92. *Not eligible target population.*
553. Cadigan S. Issues of recruitment and retention. Qld Nurse. Jan-Feb 1997;16(1):17. *Comment*.
554. Cahill J. Patient's perceptions of bedside handovers. J Clin Nurs. Jul 1998;7(4):351-359. *Not eligible target population.*
555. Cain M. Looking for positive changes in nursing. Nurs N Z. Aug 2002;8(7):28. *Not eligible target population.*
556. Calabretta N, Cavanaugh SK. Education for inpatients: working with nurses through the clinical information system. Med Ref Serv Q. Summer 2004;23(2):73-79. *Not eligible exposure.*
557. Caldwell MF. Incidence of PTSD among staff victims of patient violence. Hosp Community Psychiatry. Aug 1992;43(8):838-839. *Not eligible exposure.*
558. Callery P. Caring for parents of hospitalized children: a hidden area of nursing work. J Adv Nurs. Nov 1997;26(5):992-998. *Not eligible target population.*
559. Callery P, Smith L. A study of role negotiation between nurses and the parents of hospitalized children. J Adv Nurs. Jul 1991;16(7):772-781. *Not eligible target population.*
560. Calliari D. The relationship between a calculation test given in nursing orientation and medication errors. J Contin Educ Nurs. Jan-Feb 1995;26(1):11-14. *Not eligible exposure.*
561. Calliari D. A method to increase attendance at mandatory classes. J Nurs Staff Dev. Jul-Aug 1996;12(4):213-215. *Not eligible exposure.*
562. Calligaro KD, Miller P, Dougherty MJ, Raviola CA, DeLaurentis DA. Role of nursing personnel in implementing clinical pathways and decreasing hospital costs for major vascular surgery. J Vasc Nurs. Sep 1996;14(3):57-61. *Not eligible exposure.*
563. Callister LC. The role of the nurse in childbirth: perceptions of the childbearing woman. Clin Nurse Spec. Nov 1993;7(6):288-293, 317. *Not eligible exposure.*
564. Calpin-Davies PJ, Akehurst RL. Doctor-nurse substitution: the workforce equation. J Nurs Manag. Mar 1999;7(2):71-79. Not eligible target population.
565. Campbell C. Annualised hours. Br J Perioper Nurs. Apr 2001;11(4):170-171. *Not eligible target population.*
566. Campolo M, Pugh J, Thompson L, Wallace M. Pioneering the 12-hour shift in Australia--implementation and limitations. Aust Crit Care. Dec 1998;11(4):112-115. *Not eligible target population.*
567. Canavan K. ANA study links nurse staffing to quality. Am Nurse. May-Jun 1997;29(3):1, 3. *News.*
568 Canning S. The Beverly Allitt case. More questions than answers. Nurs Stand. Feb 23-Mar 1 1994;8(22):20. *Not eligible target population.*
569. Capitulo KL, Ankner ML, Miller J. Professional responsibility versus mandatory overtime. J Nurs Adm. Jun 2001;31(6):290-292. *Comment*.
570. Caplan CA. Nursing staff and patient perceptions of the ward atmosphere in a maximum security forensic hospital. Arch Psychiatr Nurs. Feb 1993;7(1):23-29. *Not eligible exposure.*
571. Capuano T, Bokovoy J, Halkins D, Hitchings K. Work flow analysis: eliminating non-value-added work. J Nurs Adm. May 2004;34(5):246-256. *Not eligible exposure.*
572. Capuano T, Bokovoy J, Hitchings K, Houser J. Use of a validated model to evaluate the impact of the work environment on outcomes at a magnet hospital. Health Care Manage Rev. Jul-Sep 2005;30(3):229-236. *Not eligible outcomes.*
573. Caraher M. A sociological approach to health promotion for nurses in an institutional setting. J Adv Nurs. Sep 1994;20(3):544-551. *Not eligible target population.*
574. Carey RG, Teeters JL. CQI case study: reducing medication errors. Jt Comm J Qual Improv. May 1995;21(5):232-237. *Not eligible exposure.*

575. Carlisle D. Paint and perseverance. Nurs Times. Dec 11-17 1991;87(50):39. *Comment.*
576. Carlisle D. Arts in action. A stately pleasure dome. Nurs Times. Apr 17-23 1991;87(16):28-29. *Comment.*
577. Carlisle D. A nurse in any language. Nurs Times. Sep 25-Oct 1 1996;92(39):26-27. *Comment.*
578. Carlisle D, Hempel S. Conduct unbecoming? Nurs Times. Jul 24-30 1991;87(30):18. *Comment.*
579. Carlowe J. Don't bank on it. Nurs Stand. Mar 18-24 1998;12(26):15. *News.*
580. Carlowe J. Trial by error. Nurs Times. Jul 23-29 2002;98(30):22-24. *Not eligible target population.*
581. Carr A. GRASPing the nettle, the introduction of a workload measurement tool into an accident and emergency department. Accid Emerg Nurs. Jan 1994;2(1):21-26. *No association tested.*
582. Carr SM. Refocusing health visiting -- sharpening the vision and facilitating the process. J Nurs Manag. May 2005;13(3):249-256. *Not eligible target population.*
583. Carr-Hill RA, Jenkins-Clarke S. Measurement systems in principle and in practice: the example of nursing workload. J Adv Nurs. Aug 1995;22(2):221-225. *Not eligible target population.*
584. Carrick JA. Determining case manager workload: are there secrets to success? Nurs Case Manag. May-Jun 1998;3(3):128-130. *Comment.*
585. Carroll-Johnson RM. The good news and the bad news. Nurs Diagn. Jan-Mar 2002;13(1):3-4. *Editorial.*
586. Carter H, MacInnes P. Nursing attitudes to the care of elderly patients at risk of continuing hospital care. J Adv Nurs. Sep 1996;24(3):448-455. *Not eligible target population.*
587. Carter M. Betrayal of trust. Nurs Times. Aug 11-17 1999;95(32):34-35. *Case Reports.*
588. Carveth JA. Perceived patient deviance and avoidance by nurses. Nurs Res. May-Jun 1995;44(3):173-178. *Not eligible exposure.*
589. Carzoli RP, Martinez-Cruz M, Cuevas LL, Murphy S, Chiu T. Comparison of neonatal nurse practitioners, physician assistants, and residents in the neonatal intensive care unit. Arch Pediatr Adolesc Med. Dec 1994;148(12):1271-1276. *Not eligible exposure.*
590. Cassard SD, Weisman CS, Gordon DL, Wong R. The impact of unit-based self-management by nurses on patient outcomes. Health Serv Res. Oct 1994;29(4):415-433. *Not eligible exposure.*
591. Castledine G. Case 22: The incompetent practitioner. Serious concerns about a nurse's basic competencies. Br J Nurs. Mar 9-22 2000;9(5):259. *Not eligible target population.*
592. Castledine G. Nurses need to sort out their system of care. Br J Nurs. Mar 8-21 2001;10(5):350. *Not eligible target population.*
593. Castledine G. Nurse in charge who walked out on an understaffed ward. Br J Nurs. Oct 24-Nov 13 2002;11(19):1231. *Editorial.*
594. Castledine G. Nurse who covered up for a sister who was having problems. Br J Nurs. Jan 23-Feb 12 2003;12(2):79. *Case Reports.*
595. Castledine G. Staff nurse who had an alcohol problem and made nursing errors. Br J Nurs. Nov 25-Dec 8 2004;13(21):1288. *Not eligible target population.*
596. Castledine G. Senior nurse whose incompetence resulted in the death of a patient. Br J Nurs. May 12-25 2005;14(9):516. *Not eligible target population.*
597. Castleforte MR, Fraser L. Yes, primary nursing can survive 12-hour shifts. Nurs Manage. Mar 1995;26(3):64-65. *Comment.*
598. Catalani C, Biggeri A, Gottard A, Benvenuti M, Frati E, Cecchini C. Prevalence of HCV infection among health care workers in a hospital in central Italy. Eur J Epidemiol. 2004;19(1):73-77. *Not eligible target population.*
599. Caterinicchio MJ. Redefining nursing according to patients' and families' needs: an evolving concept. AACN Certification Corporation. AACN Clin Issues. Feb 1995;6(1):153-156. *Comment.*
600. Cating G. Mandatory OT is the last straw. Revolution. Sep-Oct 2000;1(5):4. *Letter.*
601. Caty S, Larocque S, Koren I. Family-centered care in Ontario general hospitals: the views of pediatric nurses. Can J Nurs Leadersh. May-Jun 2001;14(2):10-18. *Not eligible outcomes.*
602. Cavan DA, Hamilton P, Everett J, Kerr D. Reducing hospital inpatient length of stay for patients with diabetes. Diabet Med. Feb 2001;18(2):162-164. *Not eligible target population.*
603. Celia B. Age and gender differences in pain management following coronary artery bypass surgery. J Gerontol Nurs. May 2000;26(5):7-13; quiz 52-13. *Not eligible exposure.*
604. Ceria CD. Nursing absenteeism and its effects on the quality of patient care. J Nurs Adm. Dec 1992;22(12):11, 38. *Not eligible outcomes.*
605. Cerrai T, Michelassi S, Ierpi C, Toti G, Zignego AL, Lombardi M. Universal precautions and dedicated machines as cheap and effective measures to control HCV spread. Edtna Erca J. Apr-Jun 1998;24(2):43-45, 48. *Not eligible target population.*
606. Chaaya M, Rahal B, Morou G, Kaiss N. Implementing patient-centered care in Lebanon. J Nurs Adm. Sep 2003;33(9):437-440. *Not eligible target population.*
607. Chamberlain G, Wraight A, Crowley P. Birth at home. Pract Midwife. Jul-Aug 1999;2(7):35-39. *Not eligible target population.*
608. Chan DS. Validation of the Clinical Learning Environment Inventory. West J Nurs Res. Aug 2003;25(5):519-532. *Not eligible target population.*
609. Chan FS. An evaluation of the role of the night nurse practitioner. Nurs Times. Sep 18-23 1996;92(38):38-39. *Not eligible target population.*
610. Chan JC, Chu RW, Young BW, Chan F, Chow CC, Pang WC, Chan C, Yeung SH, Chow PK, Lau J, Leung PM. Use of an electronic barcode system for patient identification during blood transfusion: 3-year experience in a regional hospital. Hong Kong Med J. Jun 2004;10(3):166-171. *Not eligible target population.*

611. Chan R, Molassiotis A, Chan E, Chan V, Ho B, Lai CY, Lam P, Shit F, Yiu I. Nurses' knowledge of and compliance with universal precautions in an acute care hospital. Int J Nurs Stud. Feb 2002;39(2):157-163. *Not eligible target population.*
612. Chan S, Lam TH. Preventing exposure to second-hand smoke. Semin Oncol Nurs. Nov 2003;19(4):284-290. *Not eligible target population.*
613. Chan SS, Leung GM, Tiwari AF, Salili F, Leung SS, Wong DC, Wong AS, Lai AS, Lam TH. The impact of work-related risk on nurses during the SARS outbreak in Hong Kong. Fam Community Health. Jul-Sep 2005;28(3):274-287. *Not eligible target population.*
614. Chandler C. Solutions for inadequate staffing. Am J Nurs. Oct 2003;103(10):14. *Comment.*
615. Chandra A, Willis WK. Importing nurses: combating the nursing shortage in America. Hosp Top. Spring 2005;83(2):33-37. *Review.*
616. Chang AM, Lam LW. Evaluation of a health care assistant pilot programme. J Nurs Manag. Jul 1997;5(4):229-236. *Not eligible target population.*
617. Chang E, Hancock K, Chenoweth L, Jeon YH, Glasson J, Gradidge K, Graham E. The influence of demographic variables and ward type on elderly patients' perceptions of needs and satisfaction during acute hospitalization. Int J Nurs Pract. Jun 2003;9(3):191-201. *Not eligible target population.*
618. Chang SO. The conceptual structure of physical touch in caring. J Adv Nurs. Mar 2001;33(6):820-827. *Not eligible target population.*
619. Charles J. Mandatory overtime: conflicts of conscience? JONAS Healthc Law Ethics Regul. Mar 2002;4(1):10-12. *Review.*
620. Chartier K. Fighting the shortage with strong retention strategies--University of Michigan Health System model. Nephrol News Issues. Jul 2004;18(8):28, 79. *Comment.*
621. Chartier K. National nurse-to-patient ratio proposed. Nephrol News Issues. Jul 2004;18(8):23. *News.*
622. Chartier K. Staff ratios: California law may spread to other states. Nephrol News Issues. Apr 2004;18(5):22. *Comment.*
623. Cheek J. Nurses and the administration of medications. Broadening the focus. Clin Nurs Res. Aug 1997;6(3):253-274. *Not eligible target population.*
624. Chen WT, Han M, Holzemer WL. Nurses' knowledge, attitudes, and practice related to HIV transmission in northeastern China. AIDS Patient Care STDS. Jul 2004;18(7):417-422. *Not eligible target population.*
625. Chesanow N. A medical crisis: who'll care for your patients? Med Econ. May 7 2001;78(9):67-68, 72, 74. *Comment.*
626. Chevron V, Menard JF, Richard JC, Girault C, Leroy J, Bonmarchand G. Unplanned extubation: risk factors of development and predictive criteria for reintubation. Crit Care Med. Jun 1998;26(6):1049-1053. *Not eligible target population.*
627. Chewitt MD, Fallis WM, Suski MC. The surgical hotline. Bridging the gap between hospital and home. J Nurs Adm. Dec 1997;27(12):42-49. *Not eligible exposure.*
628. Ching TY, Seto WH. Evaluating the efficacy of the infection control liaison nurse in the hospital. J Adv Nurs. Oct 1990;15(10):1128-1131. *Not eligible target population.*
629. Cho SH. Nurse staffing and adverse patient outcomes: a systems approach. Nurs Outlook. Mar-Apr 2001;49(2):78-85. *Review.*
630. Cho SH. Using multilevel analysis in patient and organizational outcomes research. Nurs Res. Jan-Feb 2003;52(1):61-65. *Review.*
631. Choi E, Song M. Physical restraint use in a Korean ICU. J Clin Nurs. Sep 2003;12(5):651-659. *Not eligible target population.*
632. Choi J, Bakken S, Larson E, Du Y, Stone PW. Perceived nursing work environment of critical care nurses. Nurs Res. Nov-Dec 2004;53(6):370-378. *Not eligible exposure.*
633. Choi T, Jameson H, Brekke ML, Podratz RO, Mundahl H. Effects on nurse retention. An experiment with scheduling. Med Care. Nov 1986;24(11):1029-1043. *Not eligible year.*
634. Choi-Kwon S, Lee SK, Park HA, Kwon SU, Ahn JS, Kim JS. What stroke patients want to know and what medical professionals think they should know about stroke: Korean perspectives. Patient Educ Couns. Jan 2005;56(1):85-92. *Not eligible target population.*
635. Chokbunyasit N, Potacharoen O, Sirisanthana T. Prevalence of HBV infection in nurses and manual workers in Maharaj Nakorn Chiang Mai Hospital. J Med Assoc Thai. Jul 1995;78 Suppl 1:S19-25. *Not eligible target population.*
636. Chong J, Marshall BJ, Barkin JS, McCallum RW, Reiner DK, Hoffman SR, O'Phelan C. Occupational exposure to Helicobacter pylori for the endoscopy professional: a sera epidemiological study. Am J Gastroenterol. Nov 1994;89(11):1987-1992. *Not eligible exposure.*
637. Chou KR, Lu RB, Mao WC. Factors relevant to patient assaultive behavior and assault in acute inpatient psychiatric units in Taiwan. Arch Psychiatr Nurs. Aug 2002;16(4):187-195. *Not eligible target population.*
638. Christensen P. RNs--hands-on care and more. Nurs Spectr (Wash D C). Jan 13 1997;7(1):3. *Editorial.*
639. Christmas AB, Reynolds J, Hodges S, Franklin GA, Miller FB, Richardson JD, Rodriguez JL. Physician extenders impact trauma systems. J Trauma. May 2005;58(5):917-920. *Not eligible exposure.*
640. Christmas D. Meet the travelers. Diane Christmas. Rn. Jan 2004;Suppl:30. *Interview.*
641. Chung K, Choi YB, Moon S. Toward efficient medication error reduction: error-reducing information management systems. J Med Syst. Dec 2003;27(6):553-560. *Review.*
642. Chung LH, Chong S, French P. The efficiency of fluid balance charting: an evidence-based management project. J Nurs Manag. Mar 2002;10(2):103-113. *Not eligible target population.*

643. Cimino MA, Kirschbaum MS, Brodsky L, Shaha SH. Assessing medication prescribing errors in pediatric intensive care units. Pediatr Crit Care Med. Mar 2004;5(2):124-132. *Not eligible exposure.*
644. Cimiotti JP, Wu F, Della-Latta P, Nesin M, Larson E. Emergence of resistant staphylococci on the hands of new graduate nurses. Infect Control Hosp Epidemiol. May 2004;25(5):431-435. *Not eligible outcomes.*
645. Cina J, Baroletti S, Churchill W, Hayes J, Messinger C, Mogan-McCarthy P, Harmuth Y. Interdisciplinary education program for nurses and pharmacists. Am J Health Syst Pharm. Nov 1 2004;61(21):2294-2296. *Not eligible exposure.*
646. Cirone N. Taking orders by phone? Nursing. Aug 1998;28(8):56-57. *Comment.*
647. Clark AP. Nurse staffing levels and prevention of adverse events. Clin Nurse Spec. Sep 2002;16(5):237-238. *Review.*
648. Clark BA, Rutledge C, Bush S, Knaub G, Beeken JE, Larsen PD. An experience with "research by committee". J Nurses Staff Dev. Sep-Oct 1998;14(5):244-249. *Not eligible exposure.*
649. Clark JS. An aging population with chronic disease compels new delivery systems focused on new structures and practices. Nurs Adm Q. Apr-Jun 2004;28(2):105-115. *Not eligible exposure.*
650. Clark K, Normile LB. Delays in implementing admission orders for critical care patients associated with length of stay in emergency departments in six mid-Atlantic states. J Emerg Nurs. Dec 2002;28(6):489-495. *Not eligible exposure.*
651. Clark MF. Traveling nurses. One solution to supplementing your OR staff. Aorn J. May 1992;55(5):1249-1253. *No association tested.*
652. Clark N, Kiyimba F, Bowers L, Jarrett M, McFarlane L. Absconding: nurses views and reactions. J Psychiatr Ment Health Nurs. Jun 1999;6(3):219-224. *Not eligible target population.*
653. Clarke A, Hadfield-Law L, Neal K. I've been told I have to move to another part of the unit, but I don't want to go. What doI do? Nurs Times. May 4-10 2000;96(18):30. *Comment.*
654. Clarke M. Speaking up. Nurs Times. Jan 13-19 1993;89(2):42-44. *Comment.*
655. Clarke SP. Balancing staffing and safety. Nurs Manage. Jun 2003;34(6):44-48. *Review.*
656. Clarke SP. The policy implications of staffing-outcomes research. J Nurs Adm. Jan 2005;35(1):17-19. *Review.*
657. Clarke SP, Aiken LH. Failure to rescue. Am J Nurs. Jan 2003;103(1):42-47. *Review.*
658. Clarke SP, Sloane DM, Aiken LH. Effects of hospital staffing and organizational climate on needlestick injuries to nurses. Am J Public Health. Jul 2002;92(7):1115-1119. *Not eligible outcomes.*
659. Clarke T, Abbenbroek B, Hardy L. The impact of a high dependency unit continuing education program on nursing practice and patient outcomes. Aust Crit Care. Dec 1996;9(4):138-147, 149. *Not eligible target population.*
660. Clay ML. An opinion: staff nurses at risk; increasing use of practical nurses. Pa Nurse. Mar 1997;52(3):7. *Comment.*
661. Cleary M, Edwards C. 'Something always comes up': nurse-patient interaction in an acute psychiatric setting. J Psychiatr Ment Health Nurs. Dec 1999;6(6):469-477. *Not eligible target population.*
662. Cleary PD. A hospitalization from hell: a patient's perspective on quality. Ann Intern Med. Jan 7 2003;138(1):33-39. *Case Reports.*
663. Clement J. "Change is inevitable and desirable": an interview with Ontario's Minister of Health and Long-Term Care. Interview by Peggy Leatt. Hosp Q. Fall 2001;5(1):56-59. *Interview.*
664. Clifton B. The end is night. Nurs Stand. Oct 20-26 1993;8(5):45. *Comment.*
665. Cline D, Reilly C, Moore JF. What's behind RN turnover? Nurs Manage. Oct 2003;34(10):50-53. *Comment.*
666. Clissold G, Smith P, Acutt B. The impact of unwaged domestic work on the duration and timing of sleep of female nurses working full-time on rotating 3-shift rosters. J Hum Ergol (Tokyo). Dec 2001;30(1-2):345-349. *Not eligible target population.*
667. Coates M, Heilmann S. Self-scheduling: a practical application of shared governance. Aspens Advis Nurse Exec. Aug 1993;8(11):6-7. *Comment.*
668. Cobb MD. Dealing fairly with medication errors. Nursing. Mar 1990;20(3):42-43. *Comment.*
669. Cody WK. Affirming reflection. Nurs Sci Q. Jan 1999;12(1):4-6. *Comment.*
670. Cohen H, Mandrack MM. Application of the 80/20 rule in safeguarding the use of high-alert medications. Crit Care Nurs Clin North Am. Dec 2002;14(4):369-374. *Not eligible exposure.*
671. Cohen LM, McCue JD, Green GM. Do clinical and formal assessments of the capacity of patients in the intensive care unit to make decisions agree? Arch Intern Med. Nov 8 1993;153(21):2481-2485. *Not eligible exposure.*
672. Cohen MR. Special care units need all pharmacy services. Nursing. Sep 1990;20(9):12. *Comment.*
673. Cohen MR. Don't let doctors intimidate you. Nursing. Jan 1992;22(1):18. *Case Reports.*
674. Cohen MR, Davis NM. Comments on ASHP guidelines for preventing medication errors. Am J Hosp Pharm. May 1993;50(5):913. *Comment.*
675. Cohen MZ, Hausner J, Johnson M. Knowledge and presence: accountability as described by nurses and surgical patients. J Prof Nurs. May-Jun 1994;10(3):177-185. *Not eligible exposure.*
676. Cohen-Katz J, Wiley S, Capuano T, Baker DM, Deitrick L, Shapiro S. The effects of mindfulness-based stress reduction on nurse stress and burnout: a qualitative and quantitative study, part III. Holist Nurs Pract. Mar-Apr 2005;19(2):78-86. *Not eligible exposure.*
677. Cohran J, Larson E, Roach H, Blane C, Pierce P. Effect of intravascular surveillance and education program on rates of nosocomial bloodstream infections. Heart Lung. Mar-Apr 1996;25(2):161-164. *Not eligible exposure.*

678. Coile RC, Jr. Nursing workforce shortages: "code blue" for RN staffing across America. Russ Coiles Health Trends. Nov 2001;14(1):1, 4-7. *Comment.*
679. Cole A. Shifting shifts. Nurs Times. May 15-21 1991;87(20):21. *Comment.*
680. Cole A. Satisfied customers. Nurs Times. Mar 6-12 1996;92(10):20-21. *News.*
681. Coleman JC, Paul GL. Relationship between staffing ratios and effectiveness of inpatient psychiatric units. Psychiatr Serv. Oct 2001;52(10):1374-1379. *Not eligible outcomes.*
682. Coleman S, Dracup K, Moser DK. Comparing methods of cardiopulmonary resuscitation instruction on learning and retention. J Nurs Staff Dev. Mar-Apr 1991;7(2):82-87. *Not eligible exposure.*
683. Colen HB, Neef C, Schuring RW. Identification and verification of critical performance dimensions. Phase 1 of the systematic process redesign of drug distribution. Pharm World Sci. Jun 2003;25(3):118-125. *Not eligible target population.*
684. Collier V, Fraser J, Evans C. Change from the bottom up. Nurs Times. Feb 4-10 1998;94(5):68-69. *Comment.*
685. Collins SE. Nurse attorney notes. Fla Nurse. Feb-Mar 1996;44(3):13. *Legal Cases.*
686. Colodny A. Spinal cord injury nurses in action: partners in practice. SCI Nurs. Sep 1997;14(3):79-82. *No association tested.*
687. Comack M, Smith SD, Bowman A, Gillow K, Hunt M, Snell L, Thomsen F, Turner D. Planning change in scheduling practices: a theoretical perspective. Can J Nurs Adm. Mar-Apr 1991;4(1):17-21. *No association tested.*
688. Condliffe B. Witness for the prosecution. Nurs Times. Jul 19-25 2001;97(29):26-27. *Not eligible target population.*
689. Conklin D, MacFarland V, Kinnie-Steeves A, Chenger P. Medication errors by nurses: contributing factors. AARN News Lett. Jan 1990;46(1):8-9. *No association tested.*
690. Connell J, Bradley S. Visiting children in hospital: a vision from the past. Paediatr Nurs. Apr 2000;12(3):32-35. *Not eligible target population.*
691. Conners AM. Patient classification system in a rural emergency department. Accid Emerg Nurs. Jan 1994;2(1):7-20. *No association tested.*
692. Connor D. Family-centred care in practice. Nurs N Z. May 1998;4(4):18-19. *Not eligible target population.*
693. Considine J, Ung L, Thomas S. Triage nurses' decisions using the National Triage Scale for Australian emergency departments. Accid Emerg Nurs. Oct 2000;8(4):201-209. *Not eligible target population.*
694. Conway R. The mysteries of the Milton Tank! Nurs Prax N Z. Nov 1996;11(3):27-31. *Not eligible target population.*
695. Cook AF, Hoas H, Guttmannova K, Joyner JC. An error by any other name. Am J Nurs. Jun 2004;104(6):32-43; quiz 44. *Not eligible outcomes.*
696. Cook DJ, Guyatt GH, Jaeschke R, Reeve J, Spanier A, King D, Molloy DW, Willan A, Streiner DL. Determinants in Canadian health care workers of the decision to withdraw life support from the critically ill. Canadian Critical Care Trials Group. Jama. Mar 1 1995;273(9):703-708. *Not eligible exposure.*
697. Cook R. Day in the life: Back to school nurses. Nurs Stand. Aug 12-18 1992;6(47):45. *Comment.*
698. Cooke P. One-to-one midwifery: Part 6. Mod Midwife. Sep 1996;6(9):23-25. *Comment.*
699. Cookson ST, Ihrig M, O'Mara EM, Denny M, Volk H, Banerjee SN, Hartstein AI, Jarvis WR. Increased bloodstream infection rates in surgical patients associated with variation from recommended use and care following implementation of a needleless device. Infect Control Hosp Epidemiol. Jan 1998;19(1):23-27. *Not eligible exposure.*
700. Coombs M. The challenge facing critical care nurses in the UK: a personal perspective. Nurs Crit Care. Mar-Apr 1999;4(2):81-84. *Not eligible target population.*
701. Cooper C, Connor T. Easing winter pressure: commissioning and evaluating a medical day case unit. Nurs Stand. Jun 30-Jul 6 1999;13(41):32-34. *Not eligible target population.*
702. Cooper J, Spencer D. The challenges and benefits of job sharing in palliative care education. Br J Nurs. Oct 9-22 1997;6(18):1071-1075. *Not eligible target population.*
703. Cooper JE, Tate R, Yassi A. Work hardening in an early return to work program for nurses with back injury. WORK: A Journal of Prevention, Assessment & Rehabilitation Mar 1997;8(2):149-56. *Not relevant.*
704. Cooper MC. Can a zero defects philosophy be applied to drug errors? J Adv Nurs. Mar 1995;21(3):487-491. *Not eligible target population.*
705. Cooper PG. Nurse-patient ratios revisited. Nurs Forum. Apr-Jun 2004;39(2):3-4. *Editorial.*
706. Copeland-Fields L, Griffin T, Jenkins T, Buckley M, Wise LC. Comparison of outcome predictions made by physicians, by nurses, and by using the Mortality Prediction Model. Am J Crit Care. Sep 2001;10(5):313-319. *Not eligible exposure.*
707. Corby S. Opportunity 2000 in the National Health Service: a missed opportunity for women. J Manag Med. 1997;11(5-6):279-293. *Not eligible target population.*
708. Corder L. Part-time working. Level the playing field. Nurs Times. Feb 28-Mar 5 1996;92(9):30-32. *Not eligible target population.*
709. Corley MC, Huff S, Sayles L, Short L. Patient and nurse criteria for heart transplant candidacy. Medsurg Nurs. Jun 1995;4(3):211-215. *Not eligible exposure.*
710. Cormack K. Audit of consent forms. Br J Theatre Nurs. Dec 1998;8(9):14-16. *Not eligible target population.*
711. Corona GG. We turned med/surg staff into telemetry experts. Rn. Oct 1992;55(10):21-22, 24. *No association tested.*
712. Costello A, Tsushima ST. Agency nursing: one hospital's experience. Nurs Manage. Feb 1996;27(2):63, 65, 67. *Comment.*

713 Costello A, Tsushima ST. Notes from the field. Agency nursing: one hospital's experience. Nursing management Feb 1996;27(2):63, 5, 7. *Inadequate data presentation.*
714. Costello K. Managed competition vs. single payer: what's best for patients and RNs? Calif Nurse. Jun 1994;90(6):6. *Comment.*
715. Coston B. Fighting through an appeals process. Rn. Feb 1995;58(2):57-59. *Comment.*
716. Coughlin C. Care centered organizations, Part 2. The changing role of the nurse executives. J Nurs Adm. Mar 2001;31(3):113-120. *No association tested.*
717. Cowin L. The effects of nurses' job satisfaction on retention: an Australian perspective. J Nurs Adm. May 2002;32(5):283-291. *Not eligible target population.*
718. Cox C. Should we be getting danger money? Nurs Times. Jul 19-25 2001;97(29):23. *Comment.*
719. Coyle GA, Heinen M. Evolution of BCMA within the Department of Veterans Affairs. Nurs Adm Q. Jan-Mar 2005;29(1):32-38. *Not eligible exposure.*
720. Coyle J, Williams B. Valuing people as individuals: development of an instrument through a survey of person-centredness in secondary care. J Adv Nurs. Nov 2001;36(3):450-459. *Not eligible target population.*
721. Craig EA, Hanna IT, McGilvray S, Docherty P, Donlevy S. Nurse or doctor: biometry for intraocular lens power calculation, who should measure? Health Bull (Edinb). Mar 1995;53(2):105-109. *Not eligible target population.*
722. Cramer LD, McCorkle R, Cherlin E, Johnson-Hurzeler R, Bradley EH. Nurses' attitudes and practice related to hospice care. J Nurs Scholarsh. 2003;35(3):249-255. *Not eligible target population.*
723. Crandall M. Nurse-to-patient ratios. Addressing concerns in legislation. AWHONN Lifelines. Apr-May 2000;4(2):21. *News.*
724. Crellin DJ, Johnston L. Poor agreement in application of the Australasian Triage Scale to paediatric emergency department presentations. Contemp Nurse. Aug 2003;15(1-2):48-60. *Not eligible target population.*
725. Crimlisk JT, McNulty MJ, Francione DA. New graduate RNs in a float pool. An inner-city hospital experience. J Nurs Adm. Apr 2002;32(4):211-217. *Not eligible exposure.*
726. Crispin C, Daffurn K. Nurses' responses to acute severe illness. Aust Crit Care. Dec 1998;11(4):131-133. *Not eligible target population.*
727. Crome P, McDaniel C, Rotunna S, Tachibana C. Staffing solutions: an in-house agency. Nurs Manage. Aug 1993;24(8):64A-64B, 64D, 64F. *Not eligible outcomes.*
728. Cronin-Stubbs D, Swanson B, Dean-Baar S, Sheldon JA, Duchene P. The effects of a training program on nurses' functional performance assessments. Appl Nurs Res. Feb 1992;5(1):38-43. *Not eligible exposure.*
729. Crouch D. 'I'm delighted the new role is making a difference'. Nurs Times. Nov 25-Dec 1 2003;99(47):26-27. *Comment.*
730. Crout LA, Chang E, Cioffi J. Why do registered nurses work when ill? J Nurs Adm. Jan 2005;35(1):23-28. *Not eligible target population.*
731. Crow D. Foreign nurse recruitment. Healthtexas. Aug 1991;47(2):10-11. *Comment.*
732. Crownover AJ. The other foot: who is an agency nurse? Tenn Nurse. Spring 1993;56(1):15, 20. *Comment.*
733. Cruickshank JF, MacKay RC, Matsuno K, Williams AM. Appraisal of the clinical competence of registered nurses in relation to their designated levels in the Western Australian nursing career structure. Int J Nurs Stud. Jun 1994;31(3):217-230. *Not eligible target population.*
734. Cullen L, Greiner J, Bombei C, Comried L. Excellence in evidence-based practice: organizational and unit exemplars. Crit Care Nurs Clin North Am. Jun 2005;17(2):127-142. *Not eligible exposure.*
735. Cumbie SA, Conley VM, Burman ME. Advanced practice nursing model for comprehensive care with chronic illness: model for promoting process engagement. ANS Adv Nurs Sci. Jan-Mar 2004;27(1):70-80. *Not eligible exposure.*
736. Cupitt JM, Vinayagam S, McConachie I. Radiation exposure of nurses on an intensive care unit. Anaesthesia. Feb 2001;56(2):183. *Letter.*
737. Curley MA. Caring for parents of critically ill children. Crit Care Med. Sep 1993;21(9 Suppl):S386-387. *No association tested.*
738. Curry L, Porter M, Michalski M, Gruman C. Individualized care: perceptions of certified nurse's aides. J Gerontol Nurs. Jul 2000;26(7):45-51; quiz 52-43. *Not eligible target population.*
739. Curtin L. Policies hinder nursing staff. J Emerg Nurs. Dec 2000;26(6):539. *Letter.*
740. Curtin LL. Lean, mean and stupid! Nurs Manage. May 1997;28(5):7-8. *Editorial.*
741. Curtin LL. An integrated analysis of nurse staffing and related variables: effects on patient outcomes. Online J Issues Nurs. 2003;8(3):5. *Review.*
742. Czaplinski C, Diers D. The effect of staff nursing on length of stay and mortality. Med Care. Dec 1998;36(12):1626-1638. *Not eligible exposure.*
743. Czurylo K, Gattuso M, Epsom R, Ryan C, Stark B. Continuing education outcomes related to pain management practice. J Contin Educ Nurs. Mar-Apr 1999;30(2):84-87. *Not eligible exposure.*
744. D'Addario V, Curley A. How case management can improve the quality of patient care. Int J Qual Health Care. Dec 1994;6(4):339-345. *Not eligible outcomes.*
745. D'Agata EM, Wise S, Stewart A, Lefkowitz LB, Jr. Nosocomial transmission of Mycobacterium tuberculosis from an extrapulmonary site. Infect Control Hosp Epidemiol. Jan 2001;22(1):10-12. *Not eligible exposure.*
746. Daghistani D, Horn M, Rodriguez Z, Schoenike S, Toledano S. Prevention of indwelling central venous catheter sepsis. Med Pediatr Oncol. Jun 1996;26(6):405-408. *Not eligible exposure.*

747. Dahlman GB, Dykes AK, Elander G. Patients' evaluation of pain and nurses' management of analgesics after surgery. The effect of a study day on the subject of pain for nurses working at the thorax surgery department. J Adv Nurs. Oct 1999;30(4):866-874. *Not eligible target population.*
748. Dalayon AP. Components of preoperative patient teaching in Kuwait. J Adv Nurs. Mar 1994;19(3):537-542. *Not eligible target population.*
749. Dale C, Lynch J. Blueprint for healthcare. Nurs Manag (Harrow). Oct 1996;3(6):22-24. *Not eligible target population.*
750. Dale J, Williams S, Wellesley A, Glucksman E. Training and supervision needs and experience: a longitudinal, cross-sectional survey of accident and emergency department senior house officers. Postgrad Med J. Feb 1999;75(880):86-89. *Not eligible target population.*
751. Daly BJ, Phelps C, Rudy EB. A nurse-managed special care unit. J Nurs Adm. Jul-Aug 1991;21(7-8):31-38. *Comment.*
752. Daly BJ, Thomas D, Dyer MA. Procedures used in withdrawal of mechanical ventilation. Am J Crit Care. Sep 1996;5(5):331-338. *Not eligible Exposure.*
753. Danchaivijitr S, Suthisanon L, Jitreecheue L, Tantiwatanapaibool Y. Effects of education on the prevention of pressure sores. J Med Assoc Thai. Jul 1995;78 Suppl 1:S1-6. *Not eligible target population.*
754. Dandrinos-Smith S, Garman DA, Baranowski SL, Davol LH, Person CD. The making of a supermodel. Nurs Manage. Oct 2000;31(10):33-36. *Comment.*
755. Daniel M, Banerjee AR. Is a doctor needed in the adult ENT pre-admission clinic? J Laryngol Otol. Oct 2004;118(10):796-798. *Not eligible target population.*
756. Dann D, Miller B, Hobbs M, Gentzsch P, Pierson C. Successful interviewing and selection strategies for patient-centered care delivery. Semin Nurse Manag. Mar 1995;3(1):27-35. *Comment.*
757. Darby DN, Daniel K. Factors that influence nurses' customer orientation. J Nurs Manag. Sep 1999;7(5):271-280. *Not eligible target population.*
758. Darby M. Optimal staffing for hospitals: in search of solutions. Qual Lett Healthc Lead. Jun 1999;11(6):2-10. *Review*.
759. Darling H. Satisfying a hunger ... a personal journey of self discovery through further nursing education. Nurs Prax N Z. Mar 1995;10(1):12-21. *Not eligible target population.*
760. Darmer MR, Ankersen L, Nielsen BG, Landberger G, Lippert E, Egerod I. The effect of a VIPS implementation programme on nurses' knowledge and attitudes towards documentation. Scand J Caring Sci. Sep 2004;18(3):325-332. *Not eligible target population.*
761. Darvas JA, Hawkins LG. What makes a good intensive care unit: a nursing perspective. Aust Crit Care. May 2002;15(2):77-82. *Not eligible target population.*
762. Das HS, Sawant P, Shirhatti RG, Vyas K, Vispute S, Dhadphale S, Patrawalla V, Desai N. Efficacy of low dose intradermal hepatitis B vaccine: results of a randomized trial among health care workers. Trop Gastroenterol. Jul-Sep 2002;23(3):120-121. *Not eligible exposure.*
763. Daubener J. A look at travel nursing: two sides to the coin. J Emerg Nurs. Oct 2001;27(5):507-510. *Comment.*
764. Daugherty J. "Premium shifts": a solution to an expensive option. Nurs Manage. Apr 1992;23(4):88. *Comment.*
765. Davidhizar R. Preparing a nursing department for downshifting. Todays OR Nurse. Jul-Aug 1993;15(4):51-53. *Comment.*
766. Davidhizar R, Poole V, Giger JN. Power nap rejuvenates body, mind. Pa Nurse. Mar 1996;51(3):6-7. *Comment.*
767. Davidson H, Folcarelli PH, Crawford S, Duprat LJ, Clifford JC. The effects of health care reforms on job satisfaction and voluntary turnover among hospital-based nurses. Med Care. Jun 1997;35(6):634-645. *Not eligible exposure.*
768. Davidson J. Golden slumbers. Br J Perioper Nurs. Feb 2000;10(2):74-75. *Comment.*
769. Davidson SB, Scott R, Minarik P. Thinking critically about delegation. Am J Nurs. Jun 1999;99(6):61-62. *Comment.*
770. Davies H. Client-centred midwifery. No easy option. Pract Midwife. Jun 2001;4(6):26-28. *Not eligible target population.*
771. D'Avirro J, Dotson T, LaPierre B, Marshall W, Mishler MB, Tanger JL. An interdisciplinary clinical advancement program within a patient-centered care model. Rehabil Nurs. May-Jun 1996;21(3):132-138. *Not eligible exposure*.
772. Davis D. Partnering with nurses to handle personnel shortages. Am J Health Syst Pharm. Oct 1 2002;59(19):1824-1826. *Comment.*
773. Davis E. Autonomy at work: woman-centered birth and midwifery. Midwifery Today Childbirth Educ. Summer 1997(42):23-25. *Comment.*
774. Davis JE. Nursing resources in accident and emergency departments. J Nurs Manag. Jan 1995;3(1):11-18. *Not eligible target population.*
775. Davis LA. A phenomenological study of patient expectations concerning nursing care. Holist Nurs Pract. May-Jun 2005;19(3):126-133. *Not eligible exposure.*
776. Davis NM. Always read medication labels. Am J Nurs. Nov 1993;93(11):14. *Comment.*
777. Davis NM. Combating confirmation bias. Am J Nurs. Jul 1994;94(7):17. *Comment.*
778. Davis NM. Teaching patients to prevent errors. Am J Nurs. May 1994;94(5):17. *Comment.*
779. Davis NM. Concentrating on interruptions. Am J Nurs. Mar 1994;94(3):14. *Comment.*
780. Davis R. The quick fix? Am J Nurs. Apr 1991;91(4):56. *Comment.*

781. Dawson C, Barrett V, Ross J. A case of a financial approach to manpower planning in the NHS. Health Manpow Manage. 1991;17(1):15-23. *Not eligible target population.*
782. Dawson D. Development of a new eye care guideline for critically ill patients. Intensive Crit Care Nurs. Apr 2005;21(2):119-122. *Not eligible target population*
783. Day GR. Is there a relationship between 12-hour shifts and job satisfaction in nurses? Alabama Nurse Jun-Aug 2004;31(2):11-2. *Not peer reviewed.*
784. Day T, Wainwright SP, Wilson-Barnett J. An evaluation of a teaching intervention to improve the practice of endotracheal suctioning in intensive care units. J Clin Nurs. Sep 2001;10(5):682-696. *Not eligible target population.*
785. Daynard D, Yassi A, Cooper JE, Tate R, Norman R, Wells R. Biomechanical analysis of peak and cumulative spinal loads during simulated patient-handling activities: a substudy of a randomized controlled trial to prevent lift and transfer injury of health care workers. Appl Ergon. Jun 2001;32(3):199-214. *Not eligible exposure.*
786. De Groot HA, Burke LJ, George VM. Implementing the differentiated pay structure model. Process and outcomes. J Nurs Adm. May 1998;28(5):28-38. *Not eligible exposure.*
787. de Keizer NF, Bonsel GJ, Al MJ, Gemke RJ. The relation between TISS and real paediatric ICU costs: a case study with generalizable methodology. Intensive Care Med. Oct 1998;24(10):1062-1069. *Not eligible target population.*
788. De La Cour J. Suicide in the ward setting. Nurs Times. Oct 5-11 2000;96(40):39-40. *Not eligible target population.*
789. de Lima RA, Rocha SM, Scochi CG, Callery P. Involvement and fragmentation: a study of parental care of hospitalized children in Brazil. Pediatr Nurs. Nov-Dec 2001;27(6):559-564, 580. *Not eligible target population.*
790. de Lusignan S, Wells S, Russell C. A model for patient-centred nurse consulting in primary care. Br J Nurs. Jan 23-Feb 12 2003;12(2):85-90. *Not eligible target population.*
791. de Lusignan S, Wells SE, Russell C, Bevington WP, Arrowsmith P. Development of an assessment tool to measure the influence of clinical software on the delivery of high quality consultations. A study comparing two computerized medical record systems in a nurse run heart clinic in a general practice setting. Med Inform Internet Med. Dec 2002;27(4):267-280. *Not eligible target population.*
792. de Rond M, de Wit R, van Dam F. The implementation of a Pain Monitoring Programme for nurses in daily clinical practice: results of a follow-up study in five hospitals. J Adv Nurs. Aug 2001;35(4):590-598. *Not eligible target population.*
793. de Rond ME, de Wit R, van Dam FS, Muller MJ. A Pain Monitoring Program for nurses: effect on the administration of analgesics. Pain. Dec 15 2000;89(1):25-38. *Not eligible target population.*
794. de Ruyter A. Casual work in nursing and other clinical professions: evidence from Australia. J Nurs Manag. Jan 2004;12(1):62-68. *Not eligible target population.*
795. de Vries K, Sque M, Bryan K, Abu-Saad H. Variant Creutzfeldt-Jakob disease: need for mental health and palliative care team collaboration. Int J Palliat Nurs. Dec 2003;9(12):512-520. *Not eligible target population.*
796. Dean KA. Negligent patient abandonment. Fla Nurse. Sep 2003;51(3):15. *Legal Cases*.
797. Dearholt SL, Feathers CA. Self-scheduling can work. Nurs Manage. Aug 1997;28(8):47-48. *No association tested.*
798. Dechairo-Marino AE, Jordan-Marsh M, Traiger G, Saulo M. Nurse/physician collaboration: action research and the lessons learned. J Nurs Adm. May 2001;31(5):223-232. *Not eligible outcomes.*
799. Dechant GM. Self-scheduling for nursing staff. AARN News Lett. May 1990;46(5):4-8. *No association tested.*
800. Decter MB. Canadian hospitals in transformation. Med Care. Oct 1997;35(10 Suppl):OS70-75. *Not eligible target population*
801. Deitzer D, Wessell J, Myles K, et al. Agency nurses: the right solution to staffing problems? Journal of Long-Term Care Administration Fall 1992;20(3):29-33. *Nursing home.*
802. DeMoro D. Market value & real values: industry's choice in implementing ratios. Revolution. Jan-Feb 2004;5(1):27-29. *Comment.*
803. DeMoss C, McGrail M, Jr., Haus E, Crain AL, Asche SE. Health and performance factors in health care shift workers. J Occup Environ Med. Dec 2004;46(12):1278-1281. *Not eligible outcomes.*
804. Dennis S. The Tredgold model of nursing. J Adv Nurs. Apr 1998;27(4):825-828. *Not eligible target population.*
805. Denyes MJ, Neuman BM, Villarruel AM. Nursing actions to prevent and alleviate pain in hospitalized children. Issues Compr Pediatr Nurs. Jan-Mar 1991;14(1):31-48. *Not eligible outcomes*.
806. Devadas D. Short-changed? Nurs Times. Sep 13-19 2001;97(37):27. *Comment.*
807. Devanney JJ. Testing the limits: shift rotation and the ADA. Nurs Manage. Mar 1999;30(3):35-37. *Legal Cases.*
808. Devine J. Opportunity afforded by junior doctors' hours being reduced. Nurs Stand. Jul 10-16 1991;5(42):43. *Not eligible target population.*
809. Devins GM, Paul LC, Barre PE, Mandin H, Taub K, Binik YM. Convergence of health ratings across nephrologists, nurses, and patients with end-stage renal disease. J Clin Epidemiol. Apr 2003;56(4):326-331. *Not eligible exposure.*
810. Dewsall J, King K. Children's nurse and service manager in acute paediatrics. Interview by Loretta Loach. Nurs Times. Nov 26-Dec 2 1997;93(48):40-41. *Interview*.

811. Dexter F, Epstein RH, Marcon E, de Matta R. Strategies to reduce delays in admission into a postanesthesia care unit from operating rooms. J Perianesth Nurs. Apr 2005;20(2):92-102. *Review.*
812. Dexter F, Rittenmeyer H. Quantification of phase I postanesthesia nursing activities in the phase II postanesthesia care unit. Nurs Outlook. Mar-Apr 1997;45(2):86-88. *Not eligible exposure.*
813. Diba VC, Chowdhury MM, Adisesh A, Statham BN. Occupational allergic contact dermatitis in hospital workers caused by methyldibromo glutaronitrile in a work soap. Contact Dermatitis. Feb 2003;48(2):118-119. *Not eligible target population.*
814. Dickens GL, Stubbs JH, Haw CM. Smoking and mental health nurses: a survey of clinical staff in a psychiatric hospital. J Psychiatr Ment Health Nurs. Aug 2004;11(4):445-451. *Not eligible target population.*
815. Dickenson-Hazard N. Every nurse is a leader. Nursing. Nov 2000;30(11):8. *Editorial.*
816. Dickie H, Vedio A, Dundas R, Treacher DF, Leach RM. Relationship between TISS and ICU cost. Intensive Care Med. Oct 1998;24(10):1009-1017. *Not eligible target population.*
817. Dickson J. Casualisation crisis. Nurs N Z. Jul 1993;1(4):12-14. *Not eligible target population*
818. Dickson M, King MC. The effect of child care proximity on maternal reports of separation anxiety in employed nurses. Pediatric nursing Jan-Feb 1992;18(1):64-6. *Not relevant.*
819. Didovich K. Working year. Nurs Stand. Feb 26 1997;11(23):28. *Not eligible target population.*
820. Diehl-Oplinger L, Kaminski MF. Need critical care nurses? Inquire within. Nurs Manage. Mar 2000;31(3):44, 46. *Comment.*
821. DiFrancesco M, Andrews T. Alamance Regional Medical Center improves patient safety with CPOE. J Healthc Inf Manag. Winter 2004;18(1):18-23. *Not eligible exposure.*
822. DiIorio C, Manteuffel B. Preferences concerning epilepsy education: opinions of nurses, physicians, and persons with epilepsy. J Neurosci Nurs. Feb 1995;27(1):29-34. *Not eligible exposure.*
823. Dijkers M, Paradise T. PCS: one system for both staffing and costing. Nurs Manage. Jan 1986;17(1):25-34. *Not eligible year.*
824. DiMeglio K, Padula C, Piatek C, Korber S, Barrett A, Ducharme M, Lucas S, Piermont N, Joyal E, DeNicola V, Corry K. Group cohesion and nurse satisfaction: examination of a team-building approach. J Nurs Adm. Mar 2005;35(3):110-120. *Not eligible outcomes.*
825. Dimond B. Dilemma. Linda was a nurse working on night duty and concerned about staffing levels. Accid Emerg Nurs. Jul 1998;6(3):172-174. *Not eligible target population.*
826. Dimond B. Confidentiality. 9: The law relating to whistle blowing. Br J Nurs. Oct 28-Nov 10 1999;8(19):1322-1323. *Not eligible target population.*
827. Dingley J. A computer-aided comparative study of progressive alertness changes in nurses working two different night-shift rotas. J Adv Nurs. Jun 1996;23(6):1247-1253. *Not eligible target population.*
828. Dingman SK, Williams M, Fosbinder D, Warnick M. Implementing a caring model to improve patient satisfaction. J Nurs Adm. Dec 1999;29(12):30-37. *Not eligible exposure.*
829. Dinsdale P. Post haste. Nurs Times. Mar 11-17 1998;94(10):14. *Not eligible target population.*
830. Dinsdale P. The more, the better. Nurs Stand. Jul 7-13 2004;18(43):12-13. *Not eligible target population.*
831. Discher CL, Klein D, Pierce L, Levine AB, Levine TB. Heart failure disease management: impact on hospital care, length of stay, and reimbursement. Congest Heart Fail. Mar-Apr 2003;9(2):77-83. *Not eligible exposure.*
832. Disomma C, Wilkerson S. Staff roles. All of the people most of the time. Health Serv J. Jul 13 1995;105(5461):28-29. *Not eligible target population.*
833. Dixon L. Pre-admission clinic in an ENT unit. Nurs Stand. Mar 23-29 1994;8(26):23-26. *Comment.*
834. Dodd-McCue D, Tartaglia A, Myer K, Kuthy S, Faulkner K. Unintended consequences: the impact of protocol change on critical care nurses' perceptions of stress. Prog Transplant. Mar 2004;14(1):61-67. *Not eligible exposure.*
835. Dodd-McCue D, Tartaglia A, Veazey KW, Streetman PS. The impact of protocol on nurses' role stress: a longitudinal perspective. J Nurs Adm. Apr 2005;35(4):205-216. *Not eligible exposure.*
836. Dodge JA. Patient-centred cystic fibrosis services. J R Soc Med. 2005;98 Suppl 45:2-6. *Not eligible target population.*
837. Dogan O, Ertekin S, Dogan S. Sleep quality in hospitalized patients. J Clin Nurs. Jan 2005;14(1):107-113. *Not eligible target population.*
838. Doman M, Prowse M, Webb C. Exploring nurses' experiences of providing high dependency care in children's wards. J Child Health Care. Sep 2004;8(3):180-197. *Not eligible target population.*
839. Donadio G. Improving healthcare delivery with the transformational whole person care model. Holist Nurs Pract. Mar-Apr 2005;19(2):74-77. *Not eligible* exposure.
840. Donlevy JA, Pietruch BL. The connection delivery model: care across the continuum. Nurs Manage. May 1996;27(5):34, 36. *No association tested.*
841. Donoghue J, Decker V, Mitten-Lewis S, Blay N. Critical care dependency tool: monitoring the changes. Aust Crit Care. May 2001;14(2):56-63. *Not eligible target population.*
842. Donovan JL, Peters TJ, Noble S, Powell P, Gillatt D, Oliver SE, Lane JA, Neal DE, Hamdy FC. Who can best recruit to randomized trials? Randomized trial comparing surgeons and nurses recruiting patients to a trial of treatments for localized prostate cancer (the ProtecT study). J Clin Epidemiol. Jul 2003;56(7):605-609. *Not eligible target population.*

843. Doreen F, Robinson C. "Magnet" status as markers of healthy work environments. Interview by Joanne Disch. Creat Nurs. 2002;8(2):4-6. *Interview.*
844. Dorsey G, Borneo HT, Sun SJ, Wells J, Steele L, Howland K, Perdreau-Remington F, Bangsberg DR. A heterogeneous outbreak of Enterobacter cloacae and Serratia marcescens infections in a surgical intensive care unit. Infect Control Hosp Epidemiol. Jul 2000;21(7):465-469. *Not eligible exposure.*
845. Doucette JN. Serving up uncommon service. Nurs Manage. Nov 2003;34(11):26-30. *Review.*
846. Dougan M, Lanigan C, Szalapski J. Meeting supplemental staffing needs: an in-house approach. Nurs Econ. Mar-Apr 1991;9(2):128-130, 132. *Not eligible outcomes.*
847. Douglas DA, Mayewski J. Census variation staffing. Nurs Manage. Feb 1996;27(2):32-33, 36. *Not eligible outcomes.*
848. Dowding D. Examining the effects that manipulating information given in the change of shift report has on nurses' care planning ability. J Adv Nurs. Mar 2001;33(6):836-846. *Not eligible target population.*
849. Doyle KA, Maslin-Prothero S. Promoting children's rights: the role of the children's nurse. Paediatr Nurs. Oct 1999;11(8):23-25. *Not eligible target population.*
850. Dracup K, Bryan-Brown CW. One solution to poor staffing ratios. Am J Crit Care. Mar 2001;10(2):71-73. *Editorial.*
851. Drennan V. The more things change. Nurs Times. Sep 27-Oct 3 2001;97(39):25. *Not eligible target population.*
852. Drew JA. If you don't know where you're going, anywhere you end up is OK. GHA Today. Jul 2001;45(7):2. *Comment.*
853. Driedger L. The other side of the bed. Can Nurse. Feb 2000;96(2):49-50. *Case Reports.*
854. Duchene P. Deliver empowered care. Nurs Manage. Nov 2002;33(11):11. *Comment.*
855. Duchene P. Staff ratios: just about numbers? Nurs Manage. Jul 2002;33(7):10. *Comment.*
856. Duckett R. Night nursing. Thirst for knowledge. Nurs Times. Sep 1-7 1993;89(35):29-31. *Comment.*
857. Duffin C. US survey finds link between patient recovery and nurse numbers. Nurs Manag (Harrow). Jun 2000;7(3):4. *News.*
858. Duffin C. Waiting in vain. Nurs Stand. Jan 10-16 2001;15(17):12. *Comment.*
859. Duffy D. Out of the shadows: a study of the special observation of suicidal psychiatric in-patients. J Adv Nurs. May 1995;21(5):944-950. *Not eligible target population.*
860. Dugger B. Introducing products to prevent needlesticks. Nurs Manage. Oct 1992;23(10):62-66. *Not eligible exposure.*
861. Dumais MM. Use error: a nurse's perspective. Biomed Instrum Technol. Jul-Aug 2004;38(4):313-315. *Comment.*
862. Dummett S. Avoiding drug administration errors: the way forward. Nurs Times. Jul 29-Aug 4 1998;94(30):58-60. *Not eligible target population.*
863. Dumont M, Montplaisir J, InfanteRivard C. Sleep quality of former night-shift workers... XIIth International Symposium on Night and Shiftwork. Foxwoods symposium series, June 1995. International Journal of Occupational and Environmental Health Jul-Sep 1997;3(3): Suppl):S10-4. *Conference abstract.*
864. Dumont R, van der Loo R, van Merode F, Tange H. User needs and demands of a computer-based patient record. Medinfo. 1998;9 Pt 1:64-69. *Not eligible target population.*
865. Duncan K, Pozehl B. Effects of performance feedback on patient pain outcomes. Clin Nurs Res. Nov 2000;9(4):379-397; discussion 398-401. *Not eligible outcomes.*
866. Duncan SM, Hyndman K, Estabrooks CA, et al. Nurses' experience of violence in Alberta and British Columbia hospitals. Canadian Journal of Nursing Research Mar 2001;32(4):57-78. *Not relevant*
867. Dunn L. Job sharing--the way forward? Nurs Stand. Sep 5-11 1990;4(50):32-36. *Not eligible target population.*
868. Dunton N, Gajewski B, Taunton RL, et al. Nurse staffing and patient falls on acute care hospital units. Nursing outlook Jan-Feb 2004;52(1):53-9. *Not relevant.*
869. Durham S. The phone call that changed my life. Interview by Mary Hampshire. Nurs Stand. May 17-23 2000;14(35):18-19. *Interview.*
870. Duxbury J. Avoiding disturbed sleep in hospitals. Nurs Stand. Nov 30-Dec 6 1994;9(10):31-34. *Not eligible outcomes.*
871. Duxbury J. Night nurses: why are they undervalued? Nurs Stand. Dec 7-13 1994;9(11):33-36. *No association tested.*
872. Duxbury M, Brown C, Lambert A. Surgical gloves. How do you change yours? Br J Perioper Nurs. Jan 2003;13(1):17-20. *Not eligible exposure.*
873. Dykes F. A critical ethnographic study of encounters between midwives and breast-feeding women in postnatal wards in England. Midwifery. Sep 2005;21(3):241-252. *Not eligible target population.*
874. Dzendrowskyj P, Shaw G, Johnston L. Effects of nursing industrial action on relatives of Intensive Care Unit patients: a 16-month follow-up. N Z Med J. Nov 5 2004;117(1205):U1150. *Not eligible target population.*
875. Eagle DJ, Salama S, Whitman D, Evans LA, Ho E, Olde J. Comparison of three instruments in predicting accidental falls in selected inpatients in a general teaching hospital. J Gerontol Nurs. Jul 1999;25(7):40-45. *Not eligible exposure.*
876. Eastaugh SR. Hospital nursing technical efficiency: nurse extenders and enhanced productivity. Hosp Health Serv Adm. Winter 1990;35(4):561-573. *Not eligible outcomes.*
877. Eastaugh SR. Hospital nurse productivity. J Health Care Finance. Fall 2002;29(1):14-22. *Not eligible outcomes.*
878. Eastman M. Staff mix and public safety. Nurs BC. Oct 2004;36(4):5. *Letter.*

880. Edel EM. A perioperative patient acuity system: planning and design. Nurs Manage. May 1995;26(5):48N, 48P. *Comment.*
881. Edvardsson JD, Sandman PO, Rasmussen BH. Meanings of giving touch in the care of older patients: becoming a valuable person and professional. J Clin Nurs. Jul 2003;12(4):601-609. *Not eligible target population.*
882. Edwards DF. The Synergy Model: linking patient needs to nurse competencies. Crit Care Nurse. Feb 1999;19(1):88-90, 97-89. *Case Reports.*
883. Edwards N. The implications of day surgery for in-patient hospital wards. Nurs Times. Sep 11-17 1996;92(37):32-34. *Not eligible exposure.*
884. Edwards SD. Are nursing's 'extraordinary' moral standards realistic? Nurs Times. Oct 23-29 1996;92(43):34-35. *Comment.*
885. Efraimsson E, Sandman PO, Hyden LC, Rasmussen BH. Discharge planning: "fooling ourselves?"--patient participation in conferences. J Clin Nurs. Jul 2004;13(5):562-570. *Not eligible target population.*
886. Eischens MJ, Elliott BA, Elliott TE. Two hospice quality of life surveys: a comparison. Am J Hosp Palliat Care. May-Jun 1998;15(3):143-148. *Not eligible target population.*
887. Elder R, Neal C, Davis BA, Almes E, Whitledge L, Littlepage N. Patient satisfaction with triage nursing in a rural hospital emergency department. J Nurs Care Qual. Jul-Sep 2004;19(3):263-268. *Not eligible exposure.*
888. Ellefsen B, Kim HS. Nurses' construction of clinical situations: a study conducted in an acute-care setting in Norway. Can J Nurs Res. Jun 2004;36(2):114-131. *Not eligible target population.*
889. Ellett ML, Lou Q, Chong SK. Prevalence of immunoglobulin G to Helicobacter pylori among endoscopy nurses/technicians. Gastroenterol Nurs. Jan-Feb 1999;22(1):3-6. *Not eligible outcomes.*
890. Ellila H, Sourander A, Valimaki M, Piha J. Characteristics and staff resources of child and adolescent psychiatric hospital wards in Finland. J Psychiatr Ment Health Nurs. Apr 2005;12(2):209-214. *Not eligible target population.*
891. Ellis J. Overtime and fatigue. To stay or not to stay. Nurs BC. Jun 2001;33(3):32-33. *Comment.*
892. Ellis J, Etheridge G, Buckley J. Improving the ward environment through observation of care. Nurs Times. Nov 16-22 2004;100(46):36-38. *Not eligible target population.*
893. Ellis JM. Barriers to effective screening for domestic violence by registered nurses in the emergency department. Crit Care Nurs Q. May 1999;22(1):27-41. *Not eligible exposure.*
894. Ellis S. The patient-centred care model: holistic/multiprofessional/reflective. Br J Nurs. Mar 11-24 1999;8(5):296-301. *Not eligible target population.*
895. Ellis S. More on mandatory overtime and wearing blue ribbons. J Emerg Nurs. Feb 2001;27(1):9-10. *Letter.*
896. Endacott R, Chellel A. Nursing dependency scoring: measuring the total workload. Nurs Stand. Jun 5 1996;10(37):39-42. *Not eligible target population.*
897. Endacott R, Dawson D. Clinical decisions made by nurses in intensive care--results of a telephone survey. Nurs Crit Care. Jul-Aug 1997;2(4):191-196. *Not eligible target population.*
898. Engler AJ, Cusson RM, Brockett RT, Cannon-Heinrich C, Goldberg MA, West MG, Petow W. Neonatal staff and advanced practice nurses' perceptions of bereavement/end-of-life care of families of critically ill and/or dying infants. Am J Crit Care. Nov 2004;13(6):489-498. *Not eligible exposure.*
899. Enmon P, Demetropoulos S. Bringing talk to the table. Nurs Manage. Mar 2004;35(3):50-52. *Not eligible exposure.*
900. Erickson JI, Hamilton GA, Jones DE, Ditomassi M. The value of collaborative governance/staff empowerment. J Nurs Adm. Feb 2003;33(2):96-104. *Not eligible exposure.*
901. Erickson ST. Mother's Hours: "extra" RNs balance the workload. Nurs Manage. Sep 1991;22(9):45-46, 48. *No association tested.*
902. Erlen JA, Sereika SM. Critical care nurses, ethical decision-making and stress. J Adv Nurs. Nov 1997;26(5):953-961. *Not eligible exposure.*
903. Ermer GR, McEleney BJ, West IJ. An oral history of the "joint" nursing experience at Landstuhl Regional Medical Center. Mil Med. Feb 2000;165(2):131-134. *Not eligible target population.*
904. Eschiti VS. Planting seeds at Esalen: collaborative relationships in holistic healthcare. Beginnings. Summer 2005;25(3):3, 17. *Comment.*
905. Escriba-Aguir V. Nurses' attitudes towards shiftwork and quality of life. Scand J Soc Med. Jun 1992;20(2):115-118. *Not eligible target population.*
906. Esposito L. Blizzard forces nursing home evacuation. Nurs Spectr (Wash D C). Jan 16 1996;6(2):6. *Not eligible target population.*
907. Estabrooks CA, Tourangeau AE, Humphrey CK, Hesketh KL, Giovannetti P, Thomson D, Wong J, Acorn S, Clarke H, Shamian J. Measuring the hospital practice environment: a Canadian context. Res Nurs Health. Aug 2002;25(4):256-268. *Not eligible outcomes.*
908. Estryn-Behar M, Vinck L, Caillard JF. Work schedules in health care in France: very few changes between 1991 and 1998, according to national data. J Hum Ergol (Tokyo). Dec 2001;30(1-2):327-332. *Not eligible target population.*
909. Eubanks P. New act may limit recruitment of foreign nurses. Hospitals. Feb 5 1990;64(3):67. *Comment.*
910. Evans J, Doswell N. Cross currents. Interview by Dina Leifer. Nurs Stand. Aug 15-21 2001;15(48):16. *Interview.*
911. Evans M. Putting a price on care. Low nurse-to-patient ratios save lives but are costly: study. Mod Healthc. Aug 8 2005;35(32):14. *News.*
912. Evans M. Will work for visa. Bill would boost visas for skilled workers. Mod Healthc. Jan 10 2005;35(2):16. *News.*

913. Evans ML, Martin ML, Winslow EH. Nursing care and patient satisfaction. Am J Nurs. Dec 1998;98(12):57-59. *No association tested.*
914. Evans SK, Laundon T, Yamamoto WG. Projecting staffing requirements for intensive care units. J Nurs Adm. Jul 1980;10(7):34-42. *Not eligible year.*
915. Eve M. Low staffing levels leave little time for care. Crit Care Nurse. Aug 2001;21(4):20. *Comment.*
916. Ewens A, Richards J. Concepts of health: implications for public health work. Br J Community Nurs. Aug 2000;5(8):404-408. *Not eligible target population.*
917. Facchinetti NJ, Campbell GM, Jones DP. Evaluating dispensing error detection rates in a hospital pharmacy. Med Care. Jan 1999;37(1):39-43. *Not eligible exposure.*
918. Fagerstrom L, Engberg IB, Eriksson K. A comparison between patients' experiences of how their caring needs have been met and the nurses' patient classification--an explorative study. J Nurs Manag. Nov 1998;6(6):369-377. *Not eligible target population.*
919. Fahs MC, Fulop G, Strain J, Sacks HS, Muller C, Cleary PD, Schmeidler J, Turner B. The inpatient AIDS unit: a preliminary empirical investigation of access, economic, and outcome issues. Am J Public Health. Apr 1992;82(4):576-578. *Not eligible exposure.*
920. Fairburn K. Nurses' attitudes to visiting in coronary care units. Intensive Crit Care Nurs. Sep 1994;10(3):224-233. *Not eligible outcomes.*
921. Falk-Rafael AR. Empowerment as a process of evolving consciousness: a model of empowered caring. ANS Adv Nurs Sci. Sep 2001;24(1):1-16. *Not eligible exposure.*
922. Fanello S, Jousset N, Roquelaure Y, Chotard-Frampas V, Delbos V. Evaluation of a training program for the prevention of lower back pain among hospital employees. Nurs Health Sci. Mar-Jun 2002;4(1-2):51-54. *Not eligible outcomes.*
923. Fargen J, Richards T, Kirchhoff K, et al. Mandatory overtime: a survey of registered nurses. Stat Bulletin Nov 2001;70(11):4-5. *Not peer reviewed.*
924. Farnham JA, Maez-Rauzi V, Conway K. Balancing assignments: a PCS for a step-down unit. Nurs Manage. Mar 1992;23(3):49-50, 52. *Not eligible exposure.*
925. Farr BM. Understaffing: a risk factor for infection in the era of downsizing? Infect Control Hosp Epidemiol. Mar 1996;17(3):147-149. *Comment.*
926. Farrell C, Heaven C, Beaver K, Maguire P. Identifying the concerns of women undergoing chemotherapy. Patient Educ Couns. Jan 2005;56(1):72-77. *Not eligible target population.*
927. Farrell GA. How accurately do nurses perceive patients' needs? A comparison of general and psychiatric settings. J Adv Nurs. Sep 1991;16(9):1062-1070. *Not eligible target population.*
928. Farrington M, Trundle C, Redpath C, Anderson L. Effects on nursing workload of different methicillin-resistant Staphylococcus aureus (MRSA) control strategies. J Hosp Infect. Oct 2000;46(2):118-122. *Not eligible target population.*
929. Farwell B. Health care in America: an intimate glimpse. Ann Intern Med. Dec 15 1996;125(12):1005-1006. *Comment.*
930. Feddersen E, Lockwood DH. An inpatient diabetes educator's impact on length of hospital stay. Diabetes Educ. Mar-Apr 1994;20(2):125-128. *Not eligible exposure.*
931. Feldberg C. Labor law: no minimum wage for nurses' off-premises, on-call hours. J Law Med Ethics. Fall-Winter 2001;29(3-4):413-414. *Legal Cases.*
932. Feldstein MA, Gemma PB. Oncology nurses and chronic compounded grief. Cancer Nurs. Jun 1995;18(3):228-236. *Not eligible outcomes.*
933. Feng JY, Wu YW. Nurses' intention to report child abuse in Taiwan: a test of the theory of planned behavior. Res Nurs Health. Aug 2005;28(4):337-347. *Not eligible target population.*
934. Ferguson TB, Jr. Continuous quality improvement in medicine: validation of a potential role for medical specialty societies. Am Heart Hosp J. Fall 2003;1(4):264-272. *Not eligible exposure.*
935. Fermin P, Mjolsness E, McLeay J, Chisholm L. An innovative approach to maintaining critical skills. Nurs Manage. Jan 1991;22(1):64A-64C. *No association tested.*
936. Ferns T. The nature and causes of violent incidents in intensive-care settings. Prof Nurse. Dec 2002;18(4):207-210. *Not eligible target population.*
937. Fernsebner B, Beyea S. Survey provides a snapshot of staffing challenges in the OR. OR Manager. Jun 2001;17(6):1, 10-13. *Not eligible outcomes.*
938. Ferrante A. The nursing shortage crisis in Quebec's McGill University affiliated teaching hospitals: strategies that can work. Can J Nurs Adm. Sep-Oct 1993;6(3):26-31. *No association tested.*
939. Fetzer SJ. Seeing with new eyes. J Perianesth Nurs. Dec 2003;18(6):377-379. *Editorial.*
940. Feutz SA. How to cope with under staffing. Nursing. Aug 1991;21(8):54-55. *Comment.*
941. Field PA, Renfrew M. Teaching and support: nursing input in the postpartum period. Int J Nurs Stud. 1991;28(2):131-144. *Not eligible outcomes.*
942. Fiesseler F, Szucs P, Kec R, Richman PB. Can nurses appropriately interpret the Ottawa Ankle Rule? Am J Emerg Med. May 2004;22(3):145-148. *Not eligible exposure.*
943. Fiesta J. The nursing shortage: whose liability problem? Part II. Nurs Manage. Feb 1990;21(2):22-23. *Comment.*
944. Fiesta J. Staffing implications: a legal update. Nurs Manage. Jun 1994;25(6):34-35. *Comment.*
945. Filipovich CC. Teach nurses effective ways to deal with inadequate staffing. Nurs Manage. Dec 1999;30(12):38. *Comment.*
946. Findlay J. Shifting time. Nurs Times. Jan 12-18 1994;90(2):42-44. *Comment.*

947. Findlay J, Stewart L, Kettles A. Flexible working. Good timing. Health Serv J. Jul 13 1995;105(5461):30. *Not eligible target population.*
948. Fine JM, Fine MJ, Galusha D, Petrillo M, Meehan TP. Patient and hospital characteristics associated with recommended processes of care for elderly patients hospitalized with pneumonia: results from the medicare quality indicator system pneumonia module. Arch Intern Med. Apr 8 2002;162(7):827-833. *Not eligible outcomes.*
949. Fine MJ, Orloff JJ, Rihs JD, Vickers RM, Kominos S, Kapoor WN, Arena VC, Yu VL. Evaluation of housestaff physicians' preparation and interpretation of sputum Gram stains for community-acquired pneumonia. J Gen Intern Med. May-Jun 1991;6(3):189-198. Not eligible exposure.
950. Fink JL. Emma & the med error. J Christ Nurs. Spring 2000;17(2):26-27, 29. *Comment.*
951. Fink R, Thompson CJ, Bonnes D. Overcoming barriers and promoting the use of research in practice. J Nurs Adm. Mar 2005;35(3):121-129. *Not eligible exposure.*
952. Finn T, King J, Thorburn J. The educational needs of part time clinical facilitators. Contemporary Nurse Jun 2000;9(2):132-9. *Not relevant.*
953. Finnema EJ, Louwerens JW, Slooff CJ, van den Bosch RJ. Expressed emotion on long-stay wards. J Adv Nurs. Sep 1996;24(3):473-478. *Not eligible target population.*
954. Firn S. No sex, please. Nurs Times. Apr 6-12 1994;90(14):57. *Comment.*
955. Fischer JE, Calame A, Dettling AC, Zeier H, Fanconi S. Objectifying psychomental stress in the workplace--an example. Int Arch Occup Environ Health. Jun 2000;73 Suppl:S46-52. *Not eligible target population.*
956. Fisher ML, Hinson N, Deets C. Selected predictors of registered nurses' intent to stay. J Adv Nurs. Nov 1994;20(5):950-957. *Not eligible exposure.*
957. Fisk J, Arcona S. Tympanic membrane vs. pulmonary artery thermometry. Nurs Manage. Jun 2001;32(6):42, 45-48. *Not eligible exposure.*
958. Fitch JA, Munro CL, Glass CA, Pellegrini JM. Oral care in the adult intensive care unit. Am J Crit Care. Sep 1999;8(5):314-318. *Not eligible exposure.*
959. FitzGerald EL. The possible dream. Revolution. Jan-Feb 2000;1(1):22-27. *Comment.*
960. Fitzpatrick F, Murphy OM, Brady A, Prout S, Fenelon LE. A purpose built MRSA cohort unit. J Hosp Infect. Dec 2000;46(4):271-279. *Not eligible target population.*
961. Fitzpatrick JJ, Salinas TK, O'Connor LJ, Stier L, Callahan B, Smith T, White MT. Nursing care quality initiative for care of hospitalized elders and their families. J Nurs Care Qual. Apr-Jun 2004;19(2):156-161. *Not eligible exposure.*
971. Fitzpatrick JJ, Stier L, Eichorn A, Dlugacz YD, O'Connor LJ, Salinas TK, Smith T, White MT. Hospitalized elders: changes in functional and mental status. Outcomes Manag. Jan-Mar 2004;8(1):52-56. *Not eligible outcomes.*
981. Fitzpatrick JM, While AE, Roberts JD. Shift work and its impact upon nurse performance: current knowledge and research issues. J Adv Nurs. Jan 1999;29(1):18-27. *Not eligible target population.*
982. Fitzpatrick MA. The numbers game, again? Nurs Manage. Apr 2002;33(4):6. *Editorial.*
983. Flaherty MJ. Insubordination--patient load. NLN Publ. Jun 1990(20-2294):318-326. *Not eligible exposure.*
984. Flannelly LT, Flannelly KJ, Cox. Evaluating improvements in nursing staff at a state psychiatric hospital. Issues in Mental Health Nursing Sep 2001;22(6):621-32. *Not relevant.*
985. Fletcher CE. Failure mode and effects analysis. An interdisciplinary way to analyze and reduce medication errors. J Nurs Adm. Dec 1997;27(12):19-26. *Not eligible exposure*.
986. Fletcher CE. Hospital RNs' job satisfactions and dissatisfactions. J Nurs Adm. Jun 2001;31(6):324-331. *No association tested.*
987. Fletcher E, Stevenson C. Launching the Tidal Model in an adult mental health programme. Nurs Stand. Aug 22-28 2001;15(49):33-36. *Not eligible target population.*
988. Fletcher M. Inquest produces change. Can Nurse. Nov 2001;97(10):20. *Comment.*
989. Flood D. An Afghan hospital in wartime. Nurses, physicians, and wounded fighters--a photo essay. Am J Nurs. Feb 2002;102(2):42-45. *Not eligible target population.*
990. Flook DJ, Crumplin MK. The efficiency of management of emergency surgery in a district general hospital--a prospective study. Ann R Coll Surg Engl. Jan 1990;72(1):27-31. *Not eligible target population.*
991. Flucker CJ, Hart E, Weisz M, Griffiths R, Ruth M. The 50-millilitre syringe as an inexpensive training aid in the application of cricoid pressure. Eur J Anaesthesiol. Jul 2000;17(7):443-447. *Not eligible target population.*
992. Flynn EA, Barker KN, Pepper GA, Bates DW, Mikeal RL. Comparison of methods for detecting medication errors in 36 hospitals and skilled-nursing facilities. Am J Health Syst Pharm. Mar 1 2002;59(5):436-446. *Not eligible exposure.*
993. Flynn ER, Wolf ZR, McGoldrick TB, Jablonski RA, Dean LM, McKee EP. Effect of three teaching methods on a nursing staff's knowledge of medication error risk reduction strategies. J Nurs Staff Dev. Jan-Feb 1996;12(1):19-26. *Not eligible exposure*.
994. Flynn K. Nursing in Saudi Arabia. Interview by Margaret Atkin. Qld Nurse. Jul-Aug 1990;9(4):10. *Interview.*
995. Flynn L. Agency characteristics most valued by home care nurses: findings of a nationwide study. Home Healthc Nurse. Dec 2003;21(12):812-817. *Not eligible target population.*
996. Flynn L, Aiken LH. Does international nurse recruitment influence practice values in U.S. hospitals? J Nurs Scholarsh. 2002;34(1):67-73. *Not eligible exposure.*

997. Flynn L, Deatrick JA. Home care nurses' descriptions of important agency attributes. J Nurs Scholarsh. 2003;35(4):385-390. *Not eligible target population.*
998. Flynn S. Multiple sclerosis: the Treetops model of residential care. Br J Nurs. May 9-22 2002;11(9):635-642. *Not eligible target population.*
999. Fochsen G, Sjogren K, Josephson M, Lagerstrom M. Factors contributing to the decision to leave nursing care: a study among Swedish nursing personnel. J Nurs Manag. Jul 2005;13(4):338-344. *Not eligible target population.*
1000. Fogle M. One solution to poor staffing ratios. Am J Crit Care. Jul 2001;10(4):294. *Comment.*
1001. Foley BJ, Kee CC, Minick P, Harvey SS, Jennings BM. Characteristics of nurses and hospital work environments that foster satisfaction and clinical expertise. J Nurs Adm. May 2002;32(5):273-282. *Not eligible target population.*
1002. Foley DR. Baltimore hospital bucks RN staff reduction trend. Revolution. Spring 1997;7(1):51-53. *Comment.*
1003. Foley M. Staffing: the ANA's primary concern. Am J Nurs. Jan 2001;101(1):88. *Comment.*
1004. Fondiller SH. Midwest jobfocus. Transplant care: giving patients a new lease on life. Am J Nurs. Mar 1991;91(3):73, 75-76, 78 passim. *News.*
1005. Fontaine K, Rositani R. Cost, quality, and satisfaction with hospice after-hours care. Hosp J. 2000;15(1):1-13. *Not eligible target population.*
1006. Forbes MA. The practice of professional nurse case management. Nurs Case Manag. Jan-Feb 1999;4(1):28-33. *Not eligible outcomes.*
1007. Forchuk C, Gibson D, Best H. Strike contingency planning. Can Nurse. Jan 1999;95(1):33-37. *Comment.*
1008. Forchuk C, Westwell J, Martin ML, Azzapardi WB, Kosterewa-Tolman D, Hux M. Factors influencing movement of chronic psychiatric patients from the orientation to the working phase of the nurse-client relationship on an inpatient unit. Perspect Psychiatr Care. Jan-Mar 1998;34(1):36-44. *Not eligible exposure.*
1009. Ford K, Turner D. Stories seldom told: paediatric nurses' experiences of caring for hospitalized children with special needs and their families. J Adv Nurs. Feb 2001;33(3):288-295. *Not eligible target population.*
1010. Forrester DA. AIDS-related risk factors, medical diagnosis, do-not-resuscitate orders and aggressiveness of nursing care. Nurs Res. Nov-Dec 1990;39(6):350-354. *Not eligible exposure.*
1011. Forrester DA, McCabe-Bender J, Tiedeken K. Fall risk assessment of hospitalized adults and follow-up study. J Nurses Staff Dev. Nov-Dec 1999;15(6):251-258; discussion 258-259. *Not eligible exposure.*
1012. Forrester DA, McCabe-Bender J, Walsh N, Bell-Bowe J. Physical restraint management of hospitalized adults and follow-up study. J Nurses Staff Dev. Nov-Dec 2000;16(6):267-276. *Not eligible exposure.*
1013. Forrester DA, Murphy PA. Nurses' attitudes toward patients with AIDS and AIDS-related risk factors. J Adv Nurs. Oct 1992;17(10):1260-1266. *Not eligible exposure.*
1014. Fox M. Primary nursing in long-term geriatric units. Can Nurse. Nov 1992;88(10):29, 32. *Comment.*
1015. Fox ML, Dwyer DJ. An investigation of the effects of time and involvement in the relationship between stressors and work-family conflict. J Occup Health Psychol. Apr 1999;4(2):164-174. *Not eligible exposure.*
1016. Foxall MJ, Zimmerman L, Standley R, Bene B. A comparison of frequency and sources of nursing job stress perceived by intensive care, hospice and medical-surgical nurses. J Adv Nurs. May 1990;15(5):577-584. *Not eligible exposure.*
1017. Fraenkel DJ, Cowie M, Daley P. Quality benefits of an intensive care clinical information system. Crit Care Med. Jan 2003;31(1):120-125. *Not eligible target population.*
1018. France DJ, Miles P, Cartwright J, Patel N, Ford C, Edens C, Whitlock JA. A chemotherapy incident reporting and improvement system. Jt Comm J Qual Saf. Apr 2003;29(4):171-180. *Not eligible exposure.*
1019. Francke AL, Garssen B, Luiken JB, De Schepper AM, Grypdonck M, Abu-Saad HH. Effects of a nursing pain programme on patient outcomes. Psychooncology. Dec 1997;6(4):302-310. *Not eligible exposure.*
1020. Francke AL, Luiken JB, Garssen B, Abu-Saad HH, Grypdonck M. Effects of a pain programme on nurses' psychosocial, physical and relaxation interventions. Patient Educ Couns. Jul 1996;28(2):221-230. *Not eligible exposure.*
1021. Frank IC. ED crowding and diversion: strategies and concerns from across the United States. J Emerg Nurs. Dec 2001;27(6):559-565. *Review.*
1022. Freeman BA, Coronado JR. The nursing shortage: dynamics and solutions. A supportive clinical practice model. Nurs Clin North Am. Sep 1990;25(3):551-560. *No association tested.*
1023. French E. Pediatric and neonatal nurses get "one more hand". Crit Care Nurse. Oct 1999;19(5):96. *Comment.*
1024. Frick S, Uehlinger DE, Zuercher Zenklusen RM. Medical futility: predicting outcome of intensive care unit patients by nurses and doctors--a prospective comparative study. Crit Care Med. Feb 2003;31(2):456-461. *Not eligible target population.*
1025. Frid I, Bergbom-Engberg I, Haljamae H. Brain death in ICUs and associated nursing care challenges concerning patients and families. Intensive Crit Care Nurs. Feb 1998;14(1):21-29. *Not eligible target population.*
1026. Friend B. Trapped in Iraq. Nurs Times. Nov 14-20 1990;86(46):16-17. *News.*
1027. Fryklund B, Tullus K, Berglund B, Burman LG. Importance of the environment and the faecal flora of infants, nursing staff and parents as sources of gram-negative bacteria colonizing newborns in three neonatal wards. Infection. Sep-Oct 1992;20(5):253-257. *Not eligible target population.*

1028. Fuchs BC, Pass CM. Smoking practices of hospital employed nurses. South Carolina Nurse Summer 1990;5(2):36-7. *Not relevant.*
1029. Fudge L. Team-based self-rostering. Br J Perioper Nurs. Jul 2001;11(7):310-316. *Not eligible target population.*
1030. Fujino M, Nojima Y. Effects of ward rotation on subsequent transition processes of Japanese clinical nurses. Nurs Health Sci. Mar 2005;7(1):37-44. *Not eligible target population.*
1031. Fuortes LJ, Shi Y, Zhang M, Zwerling C, Schootman M. Epidemiology of back injury in university hospital nurses from review of workers' compensation records and a case-control survey. J Occup Med. Sep 1994;36(9):1022-1026. *Not eligible outcomes*.
1032. Furillo J. Behind (and between) the lines. Revolution. Sep-Oct 2000;1(5):25-27. *Comment.*
1033. Furillo J. Ensuring safe nurse-to-patient ratios: Safe Staffing Bill mandates ratios based on patients' needs rather than budgets. West J Med. Apr 2001;174(4):233-234. *News.*
1034. Furillo J, Kercher L. Should nurse-to-patient staffing ratios be mandated by legislation? MCN Am J Matern Child Nurs. Jul-Aug 2001;26(4):176-177. *Comment.*
1035. Furlong S, Ward M. Assessing patient dependency and staff skill mix. Nurs Stand. Mar 12 1997;11(25):33-38. *Not eligible target population.*
1036. Gabrielson A. Patient-centered care in the OR: is this possible? Can Oper Room Nurs J. Mar-Apr 1997;15(1):8-10. *Comment.*
1037. Gadbois C. Different job demands of nightshifts in hospitals. J Hum Ergol (Tokyo). Dec 2001;30(1-2):295-300. *Not eligible target population.*
1038. Gagnon AJ, Waghorn K, Jones MA, Yang H. Indicators nurses employ in deciding to test for hyperbilirubinemia. J Obstet Gynecol Neonatal Nurs. Nov-Dec 2001;30(6):626-633. *Not eligible Exposure.*
1039. Gagnon J, Bouchard F, Landry M, Belles-Isles M, Fortier M, Fillion L. Implementing a hospital-based animal therapy program for children with cancer: a descriptive study. Can Oncol Nurs J. Fall 2004;14(4):210-222. *Not eligible exposure.*
1040. Gajewska K, Schroeder M, De Marre F, Vincent JL. Analysis of terminal events in 109 successive deaths in a Belgian intensive care unit. Intensive Care Med. Jun 2004;30(6):1224-1227. *Not eligible target population.*
1041. Gale J, FothergillBourbonnais F, Chamberlain M. Measuring nursing support during childbirth. MCN: The American Journal of Maternal/Child Nursing Sep-Oct 2001;26(5):264-71. *Not relevant.*
1042. Gallagher RM, Kany KA, Rowell PA, Peterson C. ANA's nurse staffing principles. Am J Nurs. Apr 1999;99(4):50, 52-53. *Review.*
1043. Gamble DA. Filipino nurse recruitment as a staffing strategy. J Nurs Adm. Apr 2002;32(4):175-177. *Not eligible target population.*
1044. Ganapathy S, Zwemer FL, Jr. Coping with a crowded ED: an expanded unique role for midlevel providers. Am J Emerg Med. Mar 2003;21(2):125-128. *Not eligible exposure.*
1045. Ganong LH, Coleman M. Effects of family structure information on nurses' impression formation and verbal responses. Res Nurs Health. Apr 1997;20(2):139-151. *Not eligible exposure.*
1046. Ganz DA, Simmons SF, Schnelle JF. Cost-effectiveness of recommended nurse staffing levels for short-stay skilled nursing facility patients. BMC Health Serv Res. May 10 2005;5(1):35. *Not eligible target population.*
1047. Garbett R. Part-time working: speaking out. Nurs Times. Sep 4-10 1996;92(36):52-53. *Not eligible target population.*
1048. Garcia de Lucio L, Garcia Lopez FJ, Marin Lopez MT, Mas Hesse B, Caamano Vaz MD. Training programme in techniques of self-control and communication skills to improve nurses' relationships with relatives of seriously ill patients: a randomized controlled study. J Adv Nurs. Aug 2000;32(2):425-431. *Not eligible target population.*
1049. Gardner KG, Tilbury M. A longitudinal cost analysis of primary and team nursing. Nursing Economics Mar-Apr 1991;9(2):97-104. *Not relevant.*
1050. Gardiner WC. Documenting JCAHO standards in assigning nursing staff. J Healthc Qual. Jul-Aug 1992;14(4):50-53. *No association tested.*
1051. Gardner DL. Career commitment in nursing. J Prof Nurs. May-Jun 1992;8(3):155-160. *Not eligible exposure.*
1052. Gardner J. Help, with strings. Hospitals may find Congress will attach some controls to funding for new nurses. Mod Healthc. Aug 6 2001;31(32):24. *Not eligible exposure.*
1053. Gardulf A, Soderstrom IL, Orton ML, Eriksson LE, Arnetz B, Nordstrom G. Why do nurses at a university hospital want to quit their jobs? J Nurs Manag. Jul 2005;13(4):329-337. *Not eligible target population.*
1054. Garfield M, Jeffrey R, Ridley S. An assessment of the staffing level required for a high-dependency unit. Anaesthesia. Feb 2000;55(2):137-143. *Not eligible target population.*
1055. Garretson S. Nurse to patient ratios in American health care. Nurs Stand. Dec 15-2005 Jan 4 2004;19(14-16):33-37. *Review.*
1056. Garrett DK, McDaniel AM. A new look at nurse burnout: the effects of environmental uncertainty and social climate. J Nurs Adm. Feb 2001;31(2):91-96. *Not eligible exposure*.
1057. Garvey A. Counting the costs. Nurs Stand. Jul 30-Aug 5 2003;17(46):12. *News*.
1058. Gary R, Marrone S, Boyles C. The use of gaming strategies in a transcultural setting. J Contin Educ Nurs. Sep-Oct 1998;29(5):221-227. *Review.*
1059. Gaston TA, Blankenship J. The shortage of full-time nurses working at the bedside is becoming a national concern. J Nurses Staff Dev. May-Jun 2004;20(3):150-151; author reply 151. *Comment.*
1060. Gates D. "Patient-focused care" and other incantations. Mo Nurse. Mar-Apr 1995;64(2):14-15. *Comment.*

1061. Gaudine AP. What do nurses mean by workload and work overload? Can J Nurs Leadersh. May-Jun 2000;13(2):22-27. *Not eligible target population.*
1062. Gaze H. Starved of attention. Nurs Times. Jan 17-23 1990;86(3):20. *Comment.*
1063. Georges CA, Bolton LB, Bennett C. Quality of care in African-American communities and the nursing shortage. J Natl Black Nurses Assoc. Dec 2003;14(2):16-24. *No association tested.*
1064. Gerace LM, Hughes TL, Spunt J. Improving nurses' responses toward substance-misusing patients: a clinical evaluation project. Arch Psychiatr Nurs. Oct 1995;9(5):286-294. *Not eligible exposure.*
1065. Geraci EB, Geraci TA. An observational study of the emergency triage nursing role in a managed care facility. Journal of Emergency Nursing Jun 1994;20(3):189-94. *Not relevant.*
1066. Gerberich SG, Church TR, McGovern PM, Hansen HE, Nachreiner NM, Geisser MS, Ryan AD, Mongin SJ, Watt GD. An epidemiological study of the magnitude and consequences of work related violence: the Minnesota Nurses' Study. Occup Environ Med. Jun 2004;61(6):495-503. *Not eligible exposure.*
1067. Gerrish K, Griffith V. Integration of overseas Registered Nurses: evaluation of an adaptation programme. J Adv Nurs. Mar 2004;45(6):579-587. *Not eligible target population.*
1068. Geschwinder RF. Anticoagulation therapy a success with patient-focused model. Nurse Pract. Aug 2004;29(8):46-47. *Not eligible exposure.*
1069. Gestes JL. Oncology outcomes among supplemental staff. Okla Nurse. Sep-Nov 2002;47(3):24-25. *Comment.*
1070. Geyer S. Workforce. Nursing arithmetic. Trustee. Jun 2003;56(6):31-32. *Comment.*
1071. Ghosh B, Cruz G. Nurse requirement planning: a computer-based model. J Nurs Manag. Jul 2005;13(4):363-371. *Not eligible target population.*
1072. Gibbs G, Harrison C. Recruitment. Dare to be different. Nurs Times. Aug 18-24 1999;95(33):36-38. *Not eligible target population.*
1073. Gill KP, Ursic P. The impact of continuing education on patient outcomes in the elderly hip fracture population. J Contin Educ Nurs. Jul-Aug 1994;25(4):181-185. *Not eligible exposure.*
1074. Gill SL. The little things: perceptions of breastfeeding support. J Obstet Gynecol Neonatal Nurs. Jul-Aug 2001;30(4):401-409. *Not eligible exposure.*
1075. Gillan J. Night nursing. Reflex action. Nurs Times. Sep 1-7 1993;89(35):26-28. *Case Reports.*
1076. Gillespie BM, Kermode S. How do perioperative nurses cope with stress? Contemp Nurse. Dec-2004 Feb 2003;16(1-2):20-29. *Review*.
1077. Gilliland M. Workforce reductions: low morale, reduced quality care. Nurs Econ. Nov-Dec 1997;15(6):320-322. *Review*.
1078. Gillis AJ. Nurses' knowledge of growth and development principles in meeting psychosocial needs of hospitalized children. J Pediatr Nurs. Apr 1990;5(2):78-87. *Not eligible exposure.*
1079. Gilman JA. A quality improvement project for better glycemic control in hospitalized patients with diabetes. Diabetes Educ. Jul-Aug 2001;27(4):541-546. *Not eligible exposure.*
1080. Ginsburg L, Norton PG, Casebeer A, Lewis S. An educational intervention to enhance nurse leaders' perceptions of patient safety culture. Health Serv Res. Aug 2005;40(4):997-1020. *Not eligible outcomes.*
1081. Giovannetti P, Johnson JM. A new generation patient classification system. J Nurs Adm. May 1990;20(5):33-40. *No association tested.*
1082. Giraud T, Dhainaut JF, Vaxelaire JF, Joseph T, Journois D, Bleichner G, Sollet JP, Chevret S, Monsallier JF. Iatrogenic complications in adult intensive care units: a prospective two-center study. Crit Care Med. Jan 1993;21(1):40-51. *Not eligible target population.*
1083. Girou E, Chai SH, Oppein F, Legrand P, Ducellier D, Cizeau F, Brun-Buisson C. Misuse of gloves: the foundation for poor compliance with hand hygiene and potential for microbial transmission? J Hosp Infect. Jun 2004;57(2):162-169. *Not eligible target population.*
1084. Gladstone J. Drug administration errors: a study into the factors underlying the occurrence and reporting of drug errors in a district general hospital. J Adv Nurs. Oct 1995;22(4):628-637. *Not eligible target population.*
1085. Glassford B. Putting patient safety first. Am J Nurs. Nov 2004;104(11):81. *Comment.*
1086. Glover D. Look before you leap. Nurs Times. Mar 3-9 1999;95(9):31. *Comment.*
1087. Gobbi M. Nursing practice as bricoleur activity: a concept explored. Nurs Inq. Jun 2005;12(2):117-125. *Not eligible target population.*
1088. Gobis L. The perils of floating. Am J Nurs. Sep 2001;101(9):78. *Legal Cases*.
1089. Godin M. A patient classification system for the hemodialysis setting. Nurs Manage. Nov 1995;26(11):66-67. *Comment.*
1090. Gold DR, Rogacz S, Bock N, Tosteson TD, Baum TM, Speizer FE, Czeisler CA. Rotating shift work, sleep, and accidents related to sleepiness in hospital nurses. Am J Public Health. Jul 1992;82(7):1011-1014. *Not eligible outcomes*.
1091. Golder DJ. Long night's journey into day. Am J Nurs. May 1994;94(5):88. *Comment.*
1092. Goldman BD. Nontraditional staffing models in long-term care. J Gerontol Nurs. Sep 1998;24(9):29-34. *Not eligible target population.*
1093. Goldman HG. Role expansion in intensive care: survey of nurses' views. Intensive Crit Care Nurs. Dec 1999;15(6):313-323. *Not eligible target population.*
1094. Goldman RL, Bates DP, 3rd, Bradbury M, Breaux DK, Caron M, Gerardo C, Copoulos S, Hansen LL, Oien SM, Semones C, et al. Marketing alternatives for hospitals to the nursing crisis. J Hosp Mark. 1990;4(1):71-95. *No association tested.*

1095. Goldstein MJ, Kim E, Widmann WD, Hardy MA. A 360 degrees evaluation of a night-float system for general surgery: a response to mandated work-hours reduction. Curr Surg. Sep-Oct 2004;61(5):445-451. *Not eligible exposure.*
1096. Golightly C, Wright LK, Pogue L. A model to facilitate interactive planning. J Nurs Adm. Sep 1990;20(9):16-19. *No association tested.*
1097. Gomez CR, Malkoff MD, Sauer CM, Tulyapronchote R, Burch CM, Banet GA. Code stroke. An attempt to shorten inhospital therapeutic delays. Stroke. Oct 1994;25(10):1920-1923. *Not eligible exposure*.
1098. Goncalves MB, Fischer FM, Lombardi Junior M, Ferreira RM. Work activities of practical nurses and risk factors for the development of musculoskeletal disorders. J Hum Ergol (Tokyo). Dec 2001;30(1-2):369-374. *Not eligible target population*.
1099. Gonzalez JC, Routh DK, Armstrong FD. Differential medication of child versus adult postoperative patients: the effect of nurses' assumptions. Child Health Care. Winter 1993;22(1):47-59. *Not eligible exposure.*
1100. Gonzalez-Torre PL, Adenso-Diaz B, Sanchez-Molero O. Capacity planning in hospital nursing: a model for minimum staff calculation. Nurs Econ. Jan-Feb 2002;20(1):28-36. *Not eligible target population*.
1101. Goodacre SW, Gillett M, Harris RD, Houlihan KP. Consistency of retrospective triage decisions as a standardised instrument for audit. J Accid Emerg Med. Sep 1999;16(5):322-324. *Not eligible target population.*
1102. Goodare L. All right on the nights. Nurs Times. Oct 21-27 2003;99(42):38-39. *Comment.*
1103. Goode CJ. Impact of a CareMap and case management on patient satisfaction and staff satisfaction, collaboration, and autonomy. Nurs Econ. Nov-Dec 1995;13(6):337-348, 361. *Not eligible exposure.*
1104. Goode CJ. What variables should I consider when making staffing decisions? Nurs Manage. Jun 2001;32(6):13-14. *Review*.
1105. Goode CJ, Krugman ME, Smith K, Diaz J, Edmonds S, Mulder J. The pull of magnetism: a look at the standards and the experience of a western academic medical center hospital in achieving and sustaining Magnet status. Nurs Adm Q. Jul-Sep 2005;29(3):202-213. *Not eligible exposure*.
1106. Gooding L. A hard day's night. Nurs Manag (Harrow). Sep 2004;11(5):23-26. *Not eligible target population.*
1107. Goossen WT, Epping PJ, Van den Heuvel WJ, Feuth T, Frederiks CM, Hasman A. Development of the Nursing Minimum Data Set for the Netherlands (NMDSN): identification of categories and items. J Adv Nurs. Mar 2000;31(3):536-547. *Not eligible target population.*
1108. Gordon S. The impact of managed care on female caregivers in the hospital and home. J Am Med Womens Assoc. Spring 1997;52(2):75-77, 80. *Not eligible outcomes.*
1109. Gordon S, Buresh B. Sounding the alarm. Am J Nurs. Jun 1996;96(6):21-22. *Comment*.
1110. Gosztyla J, Fowler S. Survival skills in the acute care workplace: a "float" pool perspective. N J Nurse. Jun-Jul 1998;28(6):14. *Comment.*
1111. Gosztyla J, Fowler S. Staff nurse column. Survival skills in the acute care workplace: a "float" pool perspective. New Jersey nurse Jun-Jul 1998;28(6):14. *Not peer reviewed.*
1112. Gottvall K, Waldenstrom U. Does birth center care during a woman's first pregnancy have any impact on her future reproduction? Birth. Sep 2002;29(3):177-181. *Not eligible target population.*
1113. Gould D. Systematic observation of hand decontamination. Nurs Stand. Aug 4-10 2004;18(47):39-44. *Not eligible target population.*
1114. Gould D, Chamberlain A. The use of a ward-based educational teaching package to enhance nurses' compliance with infection control procedures. J Clin Nurs. Jan 1997;6(1):55-67. *Not eligible exposure.*
1115. Gould J, Charlton S. The impact of change on violent patients. Nurs Stand. Feb 2-8 1994;8(19):38-40. *Not eligible exposure.*
1116. Grady C, Jacob J, Romano C. Confidentiality: a survey in a research hospital. J Clin Ethics. Spring 1991;2(1):25-30; discussion 30-24. *Not eligible exposure.*
1117. Grady C, Griffith CA. A modified simulation program addressing a staff nurse educational need identified by a student clinical nurse specialist across three shifts in a cardiac step-down unit. Clinical Nurse Specialist Mar-Apr 2006;20(2):90. *Not relevant.*
1118. Grady G. Temporary assignments can open many doors. Crit Care Nurse. Feb 2000;Suppl:18. *Comment.*
1119. Grady MA, Bloom KC. Pregnancy outcomes of adolescents enrolled in a CenteringPregnancy program. J Midwifery Womens Health. Sep-Oct 2004;49(5):412-420. *Not eligible exposure.*
1120. Graf E. Pulling from Peter to save Paul: is "floating" administratively or professionally sound? Revolution. Fall 1994;4(3):47-49. *Comment.*
1121. Graf E. Pulling from Peter to save Paul: is "floating" administratively or professionally sound? Revolution. Fall-Winter 1998;8(3-4):80-83. *Comment.*
1122. Graff LG, Radford MJ. Formula for emergency physician staffing. Am J Emerg Med. May 1990;8(3):194-199. *Not eligible exposure.*
1123. Graham IW. Reflective narrative and dementia care. J Clin Nurs. Nov 1999;8(6):675-683. *Not eligible target population.*
1124. Graham IW. Reflective practice and its role in mental health nurses' practice development: a year-long study. J Psychiatr Ment Health Nurs. Apr 2000;7(2):109-117. *Not eligible target population.*
1125. Graham MV. A day-to-day decision support tool. Nurs Manage. Mar 1995;26(3):48I, 48L. *Comment.*
1126. Granberg A, Engberg IB, Lundberg D. Acute confusion and unreal experiences in intensive care patients in relation to the ICU syndrome. Part II. Intensive Crit Care Nurs. Feb 1999;15(1):19-33. *Not eligible target population.*

1127. Grandell-Niemi H, Hupli M, Leino-Kilpi H, Puukka P. Medication calculation skills of nurses in Finland. J Clin Nurs. Jul 2003;12(4):519-528. *Not eligible target population.*
1128. Grant AM, Grinspun D, Hernandez CA. The revision of a workload measurement tool to reflect the nursing needs of patients with traumatic brain injury. Rehabil Nurs. Nov-Dec 1995;20(6):306-309, 313. *No association tested.*
1129. Grant LA, Potthoff SJ, Ryden M, Kane RA. Staff ratios, training, and assignment in Alzheimer's special care units. J Gerontol Nurs. Jan 1998;24(1):9-16; quiz 59. *Not eligible target population*.
1130. Grant M, Ferrell BR, Rivera LM, Lee J. Unscheduled readmissions for uncontrolled symptoms. A health care challenge for nurses. Nurs Clin North Am. Dec 1995;30(4):673-682. *Not eligible exposure.*
1131. Granum V. Nursing students' perceptions of nursing as a subject and a function. J Nurs Educ. Jul 2004;43(7):297-304. *Not eligible target population.*
1132. Grassman D. Development of inpatient oncology educational and support programs. Oncol Nurs Forum. May 1993;20(4):669-676. *No association tested.*
1133. Gray J, Cass J, Harper DW, O'Hara PA. A controlled evaluation of a lifts and transfer educational program for nurses. Geriatr Nurs. Mar-Apr 1996;17(2):81-85. *Review.*
1134. Gray JE, Safran C, Davis RB, Pompilio-Weitzner G, Stewart JE, Zaccagnini L, Pursley D. Baby CareLink: using the internet and telemedicine to improve care for high-risk infants. Pediatrics. Dec 2000;106(6):1318-1324. *Not eligible exposure.*
1135. Greaves C. Patients' perceptions of bedside handover. Nurs Stand. Dec 8-14 1999;14(12):32-35. *Not eligible target population.*
1136. Green A, Beeney J, Johnson N, Carlson B. Action STAT! The crisis nurse. Nurs Manage. Oct 1998;29(10):41-42. *Comment.*
1137. Green JM, Kitzinger JV, Coupland VA. Stereotypes of childbearing women: a look at some evidence. Midwifery. Sep 1990;6(3):125-132. *Not eligible target population.*
1138. Greenberg M. Hailing one of health care's priceless resources--nurses commentary. S C Nurse. Apr-Jun 2002;9(2):31. *Comment.*
1139. Greene J. From whodunit to what happened. Hosp Health Netw. Apr 1999;73(4):50-52, 54. *Comment.*
1140. Greene J. Medical staff. Hitting the visa limit. Hosp Health Netw. Jan 2004;78(1):16. *News.*
1141. Greene J, Nordhaus-Bike AM. Nurse shortage. Where have all the RNs gone? Hosp Health Netw. Aug 5-20 1998;72(15-16):78, 80. *Comment.*
1142. Greene SA, Powell CW. Expansion of clinical pharmacy services through staff development. Am J Hosp Pharm. Aug 1991;48(8):1704-1708. *Not eligible target population.*
1143. Greeneich D. Developing a consumer-focused unit culture. Aspens Advis Nurse Exec. Apr 1994;9(7):1-4. *Comment.*
1144. Greenglass ER, Burke RJ. Stress and the effects of hospital restructuring in nurses. Can J Nurs Res. Sep 2001;33(2):93-108. *Not eligible exposure*.
1145. Greengold NL, Shane R, Schneider P, Flynn E, Elashoff J, Hoying CL, Barker K, Bolton LB. The impact of dedicated medication nurses on the medication administration error rate: a randomized controlled trial. Arch Intern Med. Oct 27 2003;163(19):2359-2367. *Not eligible outcomes*.
1146. Gregoire MB. Quality of patient meal service in hospitals: delivery of meals by dietary employees vs delivery by nursing employees. J Am Diet Assoc. Oct 1994;94(10):1129-1134. *Not eligible exposure.*
1147. Gregoire MB. Who should serve patient meals? Hosp Food Nutr Focus. Jul 1995;11(11):6-7. *Not eligible exposure.*
1148. Gresk KD. Twelve-hour shifts on a new telemetry unit. Nurs Manage. Feb 1991;22(2):40-42. *No association tested*.
1149. Grewal PS, Sawant NH, Deaney CN, Gibson KM, Gupta AM, Haverty PF, Panditaratne HG, Samarasinghe SR, Sharma A, Singh S, Turner SA, Wilkinson SL, Wood SP, Glickman S. Pressure sore prevention in hospital patients: a clinical audit. J Wound Care. Mar 1999;8(3):129-131. *Not eligible target population.*
1150. Grice AS, Picton P, Deakin CD. Study examining attitudes of staff, patients and relatives to witnessed resuscitation in adult intensive care units. Br J Anaesth. Dec 2003;91(6):820-824. *Not eligible target population.*
1151. Griesmer H. Self-scheduling turned us into a winning team. Rn. Dec 1993;56(12):21-23. *No association tested.*
1152. Griffith DE, Hardeman JL, Zhang Y, Wallace RJ, Mazurek GH. Tuberculosis outbreak among healthcare workers in a community hospital. Am J Respir Crit Care Med. Aug 1995;152(2):808-811. *Case Reports.*
1153. Griffiths H. Responding to Esther's voice: improving the care of acutely ill older adults. Nurs BC. Dec 2004;36(5):8-11. *Comment.*
1154. Griffiths P. Clinical outcomes for nurse-led in-patient care. Nurs Times. Feb 28-Mar 5 1996;92(9):40-43. *Not eligible target population.*
1155. Griffiths P, Riddington L. Nurses' use of computer databases to identify evidence for practice--a cross-sectional questionnaire survey in a UK hospital. Health Info Libr J. Mar 2001;18(1):2-9. *Not eligible target population.*
1156. Grindel CG, Patsdaughter CA, Medici G, Babington LM. Adult-health/medical-surgical nurses' perceptions of students' contributions to clinical agencies. Medsurg Nurs. Apr 2003;12(2):117-123. *Not eligible exposure*.
1157. Grindel CG, Peterson K, Kinneman M, Turner TL. The Practice Environment Project. A process for outcome evaluation. J Nurs Adm. May 1996;26(5):43-51. *No association tested.*
1158. Grinspun D. Putting patients first: the role of nursing caring. Hosp Q. Summer 2000;3(4):22-24. *Comment.*

1159. Gropper EI, Boily CA. Breathing life into customer satisfaction. Nurs Manage. Nov 1999;30(11):64-68. *No association tested.*
1160. Gropper RG. Spotlight on. Redesigning faculty roles to enhance program outcomes: a case study. Nurse educator Jul-Aug 1995;20(4):5-7. *Not relevant.*
1161. Grossman I, Weiss LM, Simon D, Tanowitz HB, Wittner M. Blastocystis hominis in hospital employees. Am J Gastroenterol. Jun 1992;87(6):729-732. *Not eligible exposure.*
1162. Grossman RJ. The staffing crisis. Health Forum J. May-Jun 2002;45(3):10-15. *Review.*
1163. Grossman S, Wheeler K, Lippman D. Role-modeling experience improves nursing students' attitudes toward people living with AIDS. Nursingconnections. Spring 1998;11(1):41-49. *Not eligible exposure.*
1164. Grouse A, Bishop R. Non-medical technicians reduce emergency department waiting times. Emerg Med (Fremantle). Mar 2001;13(1):66-69. *Not eligible target population.*
1165. Grumbach K, Ash M, Seago JA, Spetz J, Coffman J. Measuring shortages of hospital nurses: how do you know a hospital with a nursing shortage when you see one? Med Care Res Rev. Dec 2001;58(4):387-403. *Not eligible exposure.*
1166. Grzybowski M, Ownby DR, Peyser PA, Johnson CC, Schork MA. The prevalence of anti-latex IgE antibodies among registered nurses. J Allergy Clin Immunol. Sep 1996;98(3):535-544. *Not eligible exposure.*
1167. Guidez C. [How can a nursing team participate in a clinical trial? Zoladex, flutamide trial]. Soins. Sep 1990(540):53. *Not eligible target population.*
1168. Gullick J. A study into safe and efficient use of defibrillators by nurses. Nurs Times. Nov 2-8 2004;100(44):42-44. *Not eligible target population.*
1169. Gullick J, Shepherd M, Ronald T. The effect of an organisational model on the standard of care. Nurs Times. Mar 9-15 2004;100(10):36-39. *Not eligible target population.*
1170. Gundogmus UN, Ozkara E, Mete S. Nursing and midwifery malpractice in Turkey based on the Higher Health Council records. Nurs Ethics. Sep 2004;11(5):489-499. *Not eligible target population.*
1171. Gunning CS. Looking to the future: health professions education in Texas. Tex Nurs. Apr 2000;74(4):11-12. *Comment.*
1172. Gupta A, Della-Latta P, Todd B, San Gabriel P, Haas J, Wu F, Rubenstein D, Saiman L. Outbreak of extended-spectrum beta-lactamase-producing Klebsiella pneumoniae in a neonatal intensive care unit linked to artificial nails. Infect Control Hosp Epidemiol. Mar 2004;25(3):210-215. *Not eligible exposure.*
1173. Gupta S, Pati AK. Desynchronization of circadian rhythms in a group of shift working nurses: effects of pattern of shift rotation. J Hum Ergol (Tokyo). Dec 1994;23(2):121-131. *Not eligible target population.*
1174. Guy J, Persaud J, Davies E, Harvey D. Drug errors: what role do nurses and pharmacists have in minimizing the risk? J Child Health Care. Dec 2003;7(4):277-290. *Not eligible target population.*
1175. Hackel R, Butt L, Banister G. How nurses perceive medication errors. Nurs Manage. Jan 1996;27(1):31, 33-34. *No association tested.*
1176. Hackenschmidt A. Living with nurse staffing ratios: early experiences. J Emerg Nurs. Aug 2004;30(4):377-379. *Review.*
1177. Haddad A. Ethics in action. A float nurse from the newborn nursery who has scant critical care experience. Rn. Jul 1995;58(7):21-22, 24. *Comment.*
1178. Haddad A. Ethics in action. "Fess up" to patients? Rn. Sep 2003;66(9):27-30. *Not eligible exposure.*
1179. Hader R, Claudio T. Seven methods to effectively manage patient care labor resources. J Nurs Adm. Feb 2002;32(2):66-68. *Review.*
1180. Hafsteinsdottir TB, Grypdonck MH. NDT competence of nurses caring for patients with stroke. J Neurosci Nurs. Oct 2004;36(5):289-294. *Not eligible target population.*
1181. Hagenow NR. Why not person-centered care? The challenges of implementation. Nurs Adm Q. Jul-Sep 2003;27(3):203-207. *Case reports.*
1182. Hagenstad R, Weis C, Brophy K. Strike a balance with decentralized housekeeping. Nurs Manage. Jun 2000;31(6):39-43. *Not eligible exposure.*
1183. Hageseth KL. Flexible scheduling and part-time work. Focus Crit Care. Aug 1991;18(4):273. *Comment.*
1184. Haggart R, Rushforth H. 'A child's eye view': the development and evaluation of a teaching video. Paediatr Nurs. Dec-2000 Jan 1999;11(10):27-30. *Not eligible exposure.*
1185. Haigh C, Neild A, Duncan F. Balance of power--do patients use researchers to survive hospital? Nurse Res. 2005;12(4):71-81. *Not eligible target population.*
1186. Hainsworth DS. The effect of death education on attitudes of hospital nurses toward care of the dying. Oncol Nurs Forum. Jul 1996;23(6):963-967. *Not eligible exposure.*
1187. Haisfield ME, McGuire DB, Krumm S, Shore AD, Zabora J, Rubin HR. Patients' and healthcare providers' opinions regarding advance directives. Oncol Nurs Forum. Aug 1994;21(7):1179-1187. *Not eligible exposure.*
1188. Hale C. Evaluating a change to primary nursing: some methodological issues. Nurs Pract. 1991;4(4):12-16. *No association tested.*
1189. Hale PC, Houghton A, Taylor PR, Mason RC, Owen WJ, Bonell C, McColl L. Crossover trial of partial shift working and a one in six rota system for house surgeons in two teaching hospitals. J R Coll Surg Edinb. Feb 1995;40(1):55-58. *Not eligible target population.*
1190. Haley RW, Cushion NB, Tenover FC, Bannerman TL, Dryer D, Ross J, Sanchez PJ, Siegel JD. Eradication of endemic methicillin-resistant Staphylococcus aureus infections from a neonatal intensive care unit. J Infect Dis. Mar 1995;171(3):614-624. *No association tested.*
1191. Hall DS. Work-related stress of registered nurses in a hospital setting. J Nurses Staff Dev. Jan-Feb 2004;20(1):6-14; quiz 15-16. *Not eligible exposure.*

1193. Hall EO. A double concern: Danish grandfathers' experiences when a small grandchild is critically ill. Intensive Crit Care Nurs. Feb 2004;20(1):14-21. *Not eligible target population.*
1194. Hall LM, Doran D. Nurse staffing, care delivery model, and patient care quality. J Nurs Care Qual. Jan-Mar 2004;19(1):27-33. *Not eligible association presentation.*
1195. Hall LM, Doran D, Laschinger HS, Mallette C, Pedersen C, O'Brien-Pallas LL. A balanced scorecard approach for nursing report card development. Outcomes Manag. Jan-Mar 2003;7(1):17-22. *Review.*
1196. Hall LMPRN. Nursing staff mix models and outcomes. Journal of Advanced Nursing October. 2003;44(2):217-226. *Not eligible outcomes.*
1197. Hall M. My sham trial. Nurs Stand. Oct 15-21 1997;12(4):18-19. *Comment.*
1198. Hallberg IR, Norberg A. Strain among nurses and their emotional reactions during 1 year of systematic clinical supervision combined with the implementation of individualized care in dementia nursing. J Adv Nurs. Dec 1993;18(12):1860-1875. *Not eligible target population.*
1199. Haller E, McNiel DE, Binder RL. Impact of a smoking ban on a locked psychiatric unit. J Clin Psychiatry. Aug 1996;57(8):329-332. *Not eligible exposure.*
1200. Halloran EJ. RN staffing: more care--less cost. Nurs Manage. Sep 1983;14(9):18-22. *Not eligible year.*
1201. Halpern JS. Leah L. Curtin discusses the nursing shortage. Int J Trauma Nurs. Jul-Sep 2000;6(3):85-87. *Interview.*
1202. Hamer G. A patient rates nurses: the good, the bad and the loving. J Christ Nurs. Summer 1990;7(3):28-31. *No association tested.*
1203. Hamilton D, Strawn N. Keeping your eye on the ball: an open letter to nurse executives. Aspens Advis Nurse Exec. Jun 1998;13(9):9-11. *Comment.*
1204. Hamilton J. Ten tips for telling people what they don't want to hear. Aspens Advis Nurse Exec. May 1993;8(8):1-2. Comment.
1205. Hamilton J, Edgar L. A survey examining nurses' knowledge of pain control. J Pain Symptom Manage. Jan 1992;7(1):18-26. *Not eligible outcomes.*
1206. Hamilton M. Combining utilization management and discharge planning. J Healthc Qual. Jul-Aug 1995;17(4):7-10, 17; quiz 17, 44. *Not eligible exposure.*
1207. Hampton S. Can electric beds aid pressure sore prevention in hospitals? Br J Nurs. Sep 24-Oct 7 1998;7(17):1010-1017. *Not eligible exposure.*
1208. Han Y, Huh SJ, Ju SG, Ahn YC, Lim do H, Lee JE, Park W. Impact of an electronic chart on the staff workload in a radiation oncology department. Jpn J Clin Oncol. Aug 2005;35(8):470-474. *Not eligible target population.*
1209. Hancock MR. A pointless system? Am J Nurs. Aug 1992;92(8):18. *Comment.*
1210. Hand D. NHS cuts: shifting attitudes. Nurs Stand. Dec 5-11 1990;5(11):20. *Not eligible target population.*
1211. Handelman E. Short-staffed but safe. Am J Nurs. Nov 2003;103(11):120. *News.*
1212. Hansen HE, Biros MH, Delaney NM, Schug VL. Research utilization and interdisciplinary collaboration in emergency care. Acad Emerg Med. Apr 1999;6(4):271-279. *Not eligible exposure.*
1213. Hanson RH, Balk JA. A replication study of staff injuries in a state hospital. Hosp Community Psychiatry. Aug 1992;43(8):836-837. *Comment.*
1214. Hansten R. Streamline change-of-shift report. Nurs Manage. Aug 2003;34(8):58-59. *Comment.*
1215. Hansten R, Washburn MJ. Professional practice: facts & impact. Am J Nurs. Mar 1998;98(3):42-45. *Comment.*
1216. Harber P, Pena L, Hsu P, Billet E, Greer D, Kim K. Personal history, training, and worksite as predictors of back pain of nurses. Am J Ind Med. Apr 1994;25(4):519-526. *Not eligible outcomes.*
1217. Hardin S, Hussey L. AACN Synergy model for patient care. Case study of a CHF patient. Crit Care Nurse. Feb 2003;23(1):73-76. *Case Reports.*
1218. Harding LK, Harding NJ, Warren H, Mills A, Thomson WH. The radiation dose to accompanying nurses, relatives and other patients in a nuclear medicine department waiting room. Nucl Med Commun. Jan 1990;11(1):17-22. *Not eligible target population.*
1219. Harding R. Reflections on family-centred care. Paediatr Nurs. Nov 1997;9(9):19-21. *Not eligible target population.*
1220. Hardy LK. Nursing work and the implications of "the second shift". Can J Nurs Adm. Nov-Dec 1990;3(4):23-26. *Not eligible exposure.*
1221. Hardy M, Barrett C. Interpretation of trauma radiographs by radiographers and nurses in the UK: a comparative study. Br J Radiol. Aug 2004;77(920):657-661. *Not eligible target population.*
1222 Hardy ML, Barrett C. Requesting and interpreting trauma radiographs: a role extension for accident & emergency nurses. Accid Emerg Nurs. Oct 2003;11(4):202-213. *Not eligible target population.*
1223. Harloe LJ, Greenway MN, O'Connor S, Fowle T, Hayes K, Pendall D, Stewart C, Squires L, Bond M, White K. Generating ideas for research: an Australian research experience. Gastroenterol Nurs. Jul-Aug 1995;18(4):138-141. *Not eligible target population.*
1224. Harmond K. Time out. Nurs Stand. May 30-Jun 5 1990;4(36):47. *Not eligible target population.*
1225. Harmond K. Caring for sick buildings. Nurs Stand. Jun 19-25 1991;5(39):44. *Not eligible target population.*
1226. Harrahill M, Eastes L. Trauma nurse practitioner: the perfect job? J Emerg Nurs. Aug 1999;25(4):337-338. *Comment.*
1227. Harrington SS, Walker BL. Is computer-based instruction an effective way to present fire safety training to long-term care staff? J Nurses Staff Dev. May-Jun 2003;19(3):147-154. *Not eligible exposure.*
1228. Harris M, Gavel P, Conn W. Planning Australia's hospital workforce. Aust Health Rev. 2002;25(5):61-77. *Not eligible target population.*

1229. Harrison JP, Nolin J, Suero E. The Effect of Case Management on U.S. Hospitals. Nursing Economics. March-April 2004 2004;22(2):64-70. *Not eligible outcomes.*
1230. Harrison S, Hutton L, Nowak M. An investigation of professional advice advocating therapeutic sun exposure. Aust N Z J Public Health. Apr 2002;26(2):108-115. *Not eligible exposure.*
1231. Hart A, Lockey R. Inequalities in health care provision: the relationship between contemporary policy and contemporary practice in maternity services in England. J Adv Nurs. Mar 2002;37(5):485-493. *Not eligible target population.*
1232. Hart J, Neiman V, Chaimoff C, Wolloch Y, Djaldetti M. Patient satisfaction in two departments of surgery in a community hospital. Isr J Med Sci. Dec 1996;32(12):1338-1343. *Not eligible target population.*
1233. Hart SE. Hospital ethical climates and registered nurses' turnover intentions. J Nurs Scholarsh. 2005;37(2):173-177. *Not eligible exposure.*
1234. Hartley J. Reduced doctors' hours. Nurs Times. Jul 27-Aug 2 2004;100(30):20-23. *Not eligible target population.*
1235. Hartley J. Nurses face a lottery over choice of shifts. Nurs Times. Jul 5-11 2005;101(27):10-11. *News.*
1236. Harty-Golder B. How should a lab design a fail-safe system for point-of-care testing? MLO Med Lab Obs. Dec 2001;33(12):22-23. *Comment*.
1237. Hasan-Stein L. Two hospitals report: the pros and cons of 12-hour shifts. Nurs N Z. Mar 1998;4(2):14-15. *Not eligible target population.*
1238. Hastings C, Waltz C. Assessing the outcomes of professional practice redesign. Impact on staff nurse perceptions. J Nurs Adm. Mar 1995;25(3):34-42. *Not eligible exposure.*
1239. Hatcher I, Sullivan M, Hutchinson J, Thurman S, Gaffney FA. An intravenous medication safety system: preventing high-risk medication errors at the point of care. J Nurs Adm. Oct 2004;34(10):437-439. *Not eligible exposure.*
1240. Havens DS, Vasey J. Measuring staff nurse decisional involvement: the Decisional Involvement Scale. J Nurs Adm. Jun 2003;33(6):331-336. *Not eligible outcomes.*
1241. Havlovic SJ, Lau DC, Pinfield LT. Repercussions of work schedule congruence among full-time, part-time, and contingent nurses. Health Care Manage Rev. Fall 2002;27(4):30-41. *Not eligible exposure.*
1242. Hawkins CA, O'Connor L, Potter S. 'The ones that got away': implementing an exit policy for nurses in a public hospital. Contemp Nurse. Aug 2003;15(1-2):29-36. *Not eligible target population.*
1243. Hawkins T, Sutton K. Self-scheduling in a CVICU (cardiovascular intensive care unit). Nurs Manage. Nov 1991;22(11):64A, 64D, 64F passim. *Not eligible outcomes.*
1244. Hay E, Bekerman L, Rosenberg G, Peled R. Quality assurance of nurse triage: consistency of results over three years. Am J Emerg Med. Mar 2001;19(2):113-117. *Not eligible target population.*
1245. Hayes J. Non-nursing duties are eroding our status. Aust Nurs J. Dec-2000 Jan 1999;7(6):3. *Not eligible target population.*
1246. Hayes J. Time to change. Nurs Stand. Feb 23-Mar 1 2005;19(24):78. *Comment.*
1247. Haynes G, Lewer H, Woolford P. Night nurse practitioners are not 'mini-doctors'. Br J Nurs. Nov 26-Dec 9 1992;1(14):722-725. *Comment.*
1248. Healy AN. Teaming up for more with less. Provider. Apr 2004;30(4):41-42. *Comment.*
1249. Heatlie JM. Reducing insulin medication errors: evaluation of a quality improvement initiative. J Nurses Staff Dev. Mar-Apr 2003;19(2):92-98. *Not eligible exposure.*
1250. Hecht WA, Landstrom G, Nisbet MM, Ratcliffe CJ, Tyler JL. Meeting the nursing shortage head on. A round table discussion. Healthc Financ Manage. Mar 2003;57(3):52-58, 60. *Comment.*
1251. Heckert DA, Fottler MD, Swartz BW, Mercer AA. The impact of the changing healthcare environment on the attitudes of nursing staff: a longitudinal case study. Health Serv Manage Res. Aug 1993;6(3):191-202. *Not eligible exposure.*
1252. Hedstrom M, Skolin I, von Essen L. Distressing and positive experiences and important aspects of care for adolescents treated for cancer. Adolescent and nurse perceptions. Eur J Oncol Nurs. Mar 2004;8(1):6-17; discussion 18-19. *Not eligible target population.*
1253. Heinz D. Hospital nurse staffing and patient outcomes: a review of current literature. Dimens Crit Care Nurs. Jan-Feb 2004;23(1):44-50. *Review.*
1254. Heller A. Nurses rightfully are tired. Mich Nurse. Feb 2001;74(2):4-5. *Comment.*
1255. Hemmings P. Shift systems: staying power. Nurs Stand. Aug 10-16 1994;8(46):42. *Comment.*
1256. Hendel T, Fish M, Aboudi S. Strategies used by hospital nurses to cope with a national crisis: a manager's perspective. Int Nurs Rev. Dec 2000;47(4):224-231. *Not eligible target population.*
1257. Hendel T, Fish M, Galon V. Leadership style and choice of strategy in conflict management among Israeli nurse managers in general hospitals. J Nurs Manag. Mar 2005;13(2):137-146. *Not eligible target population.*
1258. Hendler I, Nahtomi O, Segal E, Perel A, Wiener M, Meyerovitch J. The effect of full protective gear on intubation performance by hospital medical personnel. Mil Med. Apr 2000;165(4):272-274. *Not eligible target population.*
1259. Hendy R. Auditing PICC line management. Nurs Times. Sep 20-26 2001;97(38):32-33. *Not eligible target population.*
1260. Henneman EA, Gawlinski A. A "near-miss" model for describing the nurse's role in the recovery of medical errors. J Prof Nurs. May-Jun 2004;20(3):196-201. *Not eligible exposure*.
1261. Henninger DE, Nolan MT. A comparative evaluation of two educational strategies to promote publication by nurses. J Contin Educ Nurs. Mar-Apr 1998;29(2):79-84. *Not eligible exposure.*

1262. Hensing G, Alexanderson K. The association between sex segregation, working conditions, and sickness absence among employed women. Occup Environ Med. Feb 2004;61(2):e7. *Not eligible target population.*
1263. Hensinger B, Harkins D, Bruce T. Self-scheduling: two success stories. No more short staffing. Am J Nurs. Mar 1993;93(3):66-69. *Comment.*
1264. Herman CJ, Speroff T, Cebul RD. Improving compliance with immunization in the older adult: results of a randomized cohort study. J Am Geriatr Soc. Nov 1994;42(11):1154-1159. *Not eligible exposure.*
1265. Herrmann J. Canadian nurses head South. Health Syst Rev. May-Jun 1992;25(3):33-35. *News.*
1266. Herrmann LL, Zabramski JM. Tandem practice model: a model for physician-nurse practitioner collaboration in a specialty practice, neurosurgery. J Am Acad Nurse Pract. Jun 2005;17(6):213-218. *Review.*
1267. Hertting A, Nilsson K, Theorell T, Larsson US. Downsizing and reorganization: demands, challenges and ambiguity for registered nurses. J Adv Nurs. Jan 2004;45(2):145-154. *Not eligible target population.*
1268. Hess RG, Jr. Wrinkles in time. Nurs Spectr (Wash D C). May 5 1997;7(9):3. *Editorial.*
1269. Hesterly SC, Schaffner A, Lounsbery K. Milestone Action Plans. Empowering nurses to manage care. J Nurs Adm. Nov 1992;22(11):53-56. *No association tested.*
1270. Hewitt BE. The challenge of providing family-centred care during air transport: an example of reflection on action in nursing practice. Contemp Nurse. Aug 2003;15(1-2):118-124. *Not eligible exposure.*
1271. Hewlett PO. Conceptualizing nursing work-force redevelopment. J Nurs Adm. Oct 1999;29(10):8-10, 29. *No association tested.*
1272. Heyman EN, Lombardo BA. Managing costs: the confused, agitated, or suicidal patient. Nurs Econ. Mar-Apr 1995;13(2):107-111, 118. *Not eligible exposure.*
1273. Hibbs PJ. Skill mix in hospital. Sr Nurse. Sep-Oct 1992;12(5):14-17. *No association tested.*
1274. Higgins J, Wiles R. Private patients' perceptions of nursing practice in the National Health Service. Nurs Pract. 1992;5(3):20-22. *Not eligible target population.*
1275. Higgins LW. Nurses' perceptions of collaborative nurse-physician transfer decision making as a predictor of patient outcomes in a medical intensive care unit. J Adv Nurs. Jun 1999;29(6):1434-1443. *Not eligible outcomes.*
1276. Higgins R, Hurst K, Wistow G. Nursing acute psychiatric patients: a quantitative and qualitative study. J Adv Nurs. Jan 1999;29(1):52-63. *Not eligible target population.*
1277. Higuchi KA, Dulberg C, Duff V. Factors associated with nursing diagnosis utilization in Canada. Nurs Diagn. Oct-Dec 1999;10(4):137-147. *Not eligible exposure.*
1278. Hill A, Burge A, Skinner C. Tuberculosis in National Health Service hospital staff in the west Midlands region of England, 1992-5. Thorax. Nov 1997;52(11):994-997. *Not eligible target population.*
1279. Hilton J. A care pathway for home parenteral nutrition. Nurs Times. May 4-10 2000;96(18):38-39. *Not eligible exposure.*
1280. Hilton P, Goddard M. Taken to task. Nurs Times. Apr 17-23 1996;92(16):44-45. *Not eligible target population.*
1281. Himali U. An unsafe equation: fewer RNs = more workplace injuries. Am Nurse. Jul-Aug 1995;27(5):19. *Comment.*
1282. Himali U. ANA sounds alarm about unsafe staffing levels: PR campaing sheds light on RN replacement trends. Am Nurse. Mar 1995;27(2):1, 7. *Comment.*
1283. Hinds PS, Hockenberry-Eaton M, Gilger E, Kline N, Burleson C, Bottomley S, Quargnenti A. Comparing patient, parent, and staff descriptions of fatigue in pediatric oncology patients. Cancer Nurs. Aug 1999;22(4):277-288; quiz 288-279. *Not eligible exposure.*
1284. Hines J. Communication problems of hearing-impaired patients. Nurs Stand. Jan 26-Feb 1 2000;14(19):33-37. *Not eligible exposure.*
1285. Hinshaw AS, Scofield R, Atwood JR. Staff, patient, and cost outcomes of all-registered nurse staffing. J Nurs Adm. Nov-Dec 1981;11(11-12):30-36. *Not eligible year.*
1286. Hirter J, Van Nest RL. Vigilance: a concept and a reality. Crna. May 1995;6(2):96-98. *Comment.*
1287. Hiscott RD. Changes in employment status: the experiences of Ontario registered nurses. Canadian Journal of Nursing Research Summer 1994;26(2):43-60. *Not relevant.*
1288. Hiscott RD. Changes in the school-to-work transition for Canadian nursing program graduates. Canadian Journal of Nursing Research Winter 1995;27(4):151-63. *Not relevant.*
1289. Hiscott RD, Connop PJ. Job turnover among nursing professionals: impact of shift length and kinship responsibilities. Sociology and Social Research Oct 1990;75(1):32-7. *Not relevant.*
1290. Hiscott RD, Sharratt MT, Stewart TO, et al. Research examines nurse mobility. Registered Nurse Oct-Nov 1993;5(5):38-40. *Not peer reviewed.*
1291. Hitchings KS. Job sharing: a viable option. Nurs Staff Dev Insid. May-Jun 1992;1(3):3, 8. *No association tested.*
1292. Hodby D. Dollars and sense: the economics and outcomes of patients undergoing carotid endarterectomy at Royal Adelaide Hospital. J Vasc Nurs. Mar 2002;20(1):6-11; quiz 12-13. *Not eligible target population.*
1293. Hodge MB. The effect of 12 hour shifts on cognition, fatigue, and mood in acute care nurses... 34th Annual Communicating Nursing Research Conference/15th Annual WIN Assembly, "Health Care Challenges Beyond 2001: Mapping the Journey for Research and Practice," held April 19-21, 2001 in Seattle, Washington. Communicating nursing research Spring 2001;34:296. *Conference abstract.*

1294. Hodge MB, Asch SM, Olson VA, Kravitz RL, Sauve MJ. Developing indicators of nursing quality to evaluate nurse staffing ratios. J Nurs Adm. Jun 2002;32(6):338-345. *Not eligible outcomes.*
1295. Hodgson J. Nursing must look after its young. Nurs Stand. Oct 18-24 1995;10(4):47. *Comment.*
1296. Hodnett ED, Lowe NK, Hannah ME, Willan AR, Stevens B, Weston JA, Ohlsson A, Gafni A, Muir HA, Myhr TL, Stremler R. Effectiveness of nurses as providers of birth labor support in North American hospitals: a randomized controlled trial. Jama. Sep 18 2002;288(11):1373-1381. *Not eligible outcomes.*
1297. Hoffart N, Willdermood S. Self-scheduling in five med/surg units. A comparison. Nurs Manage. Apr 1997;28(4):42-45; quiz 426. *No association tested.*
1298. Hoffman AJ, Scott LD. Role stress and career satisfaction among registered nurses by work shift patterns. J Nurs Adm. Jun 2003;33(6):337-342. *Not eligible outcomes.*
1299. Hoffman LA, Tasota FJ, Zullo TG, Scharfenberg C, Donahoe MP. Outcomes of care managed by an acute care nurse practitioner/attending physician team in a subacute medical intensive care unit. Am J Crit Care. Mar 2005;14(2):121-130; quiz 131-122. *Not eligible exposure.*
1300. Hogan J. Staff ratios in intensive care: are they adequate? Br J Nurs. Jul 13-26 2000;9(13):817. *Not eligible target population.*
1301. Hogan J, Playle JF. The utilization of the healthcare assistant role in intensive care. Br J Nurs. Jun 22-Jul 12 2000;9(12):794-801. *Not eligible target population.*
1302. Hogan M. Understanding rostering. Part 5. Shiftwork and the hierarchy. Aust Nurs J. Jul 1995;3(1):34-36. *Comment.*
1303. Hogston R. Evaluating quality nursing care through peer review and reflection; the findings of a qualitative study. Int J Nurs Stud. Apr 1995;32(2):162-172. *Not eligible target population.*
1304. Holdnak BJ, Harsh J, Bushardt SC. An examination of leadership style and its relevance to shift work in an organizational setting. Health care management review Summer 1993;18(3):21-30. *Not relevant.*
1305. Hollar-Ruegg T. Recruiting nurses from the Philippines to combat the nursing shortage in central Ohio. Ohio Nurses Rev. Feb 2002;77(2):4. *Letter.*
1306. Holle ML. A prescription for success: integrating 12 inpatient and 17 outpatient programs. Aspens Advis Nurse Exec. Jan 1995;10(4):1-3. *Comment.*
1307. Hollingdale R, Warin J. Back pain in nursing and associated factors: a study. Nurs Stand. Jun 18 1997;11(39):35-38. *Not eligible exposure.*
1308. Holloway IM, Smith P, Warren J. Time in hospital. J Clin Nurs. Sep 1998;7(5):460-466. *Not eligible target population.*
1309. Holmas TH. Keeping nurses at work: a duration analysis. Health Econ. Sep 2002;11(6):493-503. *Not eligible target population.*
1310. Holmes L. Theatre nursing (2). Br J Theatre Nurs. Oct 1994;4(7):27-28. *Comment.*
1311. Holness A, Williams J, Scott E, Bolstad B, McCrary P. Shift coordinators dispel myths. Nurs Manage. Oct 1992;23(10):81-82. *Comment.*
1312. Holness DL, Tarlo SM, Sussman G, Nethercott JR. Exposure characteristics and cutaneous problems in operating room staff. Contact Dermatitis. Jun 1995;32(6):352-358. *Not eligible exposure.*
1313. Holt AW, Bersten AD, Fuller S, Piper RK, Worthley LI, Vedig AE. Intensive care costing methodology: cost benefit analysis of mask continuous positive airway pressure for severe cardiogenic pulmonary oedema. Anaesth Intensive Care. Apr 1994;22(2):170-174. *Not eligible target population.*
1314. Holt AW, Bury LK, Bersten AD, Skowronski GA, Vedig AE. Prospective evaluation of residents and nurses as severity score data collectors. Crit Care Med. Dec 1992;20(12):1688-1691. *Not eligible target population.*
1315. Holtom BC, O'Neill BS. Job embeddedness: a theoretical foundation for developing a comprehensive nurse retention plan. J Nurs Adm. May 2004;34(5):216-227. *Not eligible outcomes.*
1316. Holyoake DD. Who's the boss? Children's perception of hospital hierarchy. Paediatr Nurs. Jun 1999;11(5):33-36. *Not eligible exposure.*
1317. Homsted L, Nilsson M. Safe staffing: a serious concern. Fla Nurse. Mar 2003;51(1):1, 14. *Comment.*
1318. Hopia H, Tomlinson PS, Paavilainen E, Astedt-Kurki P. Child in hospital: family experiences and expectations of how nurses can promote family health. J Clin Nurs. Feb 2005;14(2):212-222. *Not eligible target population.*
1319. Hopkins S. Junior doctors' hours and the expanding role of the nurse. Nurs Times. Apr 3-9 1996;92(14):35-36. *Not eligible exposure.*
1320. Horner M. A review of a supervised practice programme for overseas nurses. Nurs Times. Jul 6-12 2004;100(27):38-41. *Not eligible exposure.*
1321. Horns KM, Gills MB. Neonatal nurse knowledge of penicillin therapy. Neonatal Netw. Oct 1998;17(7):52-55. *Case Reports.*
1322. Hostetter A, Roda PI, Phillips CY. Heart-smart service. Nurs Manage. Jan 2001;32(1):22-25. *Not eligible exposure.*
1323. Hostutler JJ, Taft SH, Snyder C. Patient needs in the emergency department: nurses' and patients' perceptions. J Nurs Adm. Jan 1999;29(1):43-50. *Not eligible exposure.*
1324. Hotchkiss JR, Strike DG, Simonson DA, Broccard AF, Crooke PS. An agent-based and spatially explicit model of pathogen dissemination in the intensive care unit. Crit Care Med. Jan 2005;33(1):168-176; discussion 253-164. *Not eligible exposure.*
1325. Houchins G. Taking a closer look at employee turnover in the dialysis unit. Nephrol News Issues. Sep 1995;9(9):37-38. *Comment.*
1326. Houser BP. The power of collaboration: Arizona's best kept secret. Nurs Adm Q. Jul-Sep 2005;29(3):263-267. *Review.*
1327. Houser E. It's all in the mix. Mich Health Hosp. Mar-Apr 2000;36(2):24-26. *Comment.*

1328. Houser J. A model for evaluating the context of nursing care delivery. J Nurs Adm. Jan 2003;33(1):39-47. *Not eligible target population.*
1329. Howell M. Confidentiality during staff reports at the bedside. Nurs Times. Aug 24-30 1994;90(34):44-45. *Not eligible exposure.*
1330. Howenstein MA, Bilodeau K, Brogna MJ, Good G. Factors associated with critical thinking among nurses. J Contin Educ Nurs. May-Jun 1996;27(3):100-103. *Not eligible outcomes.*
1331. Howse E, Bailey J. Resistance to documentation--a nursing research issue. Int J Nurs Stud. Nov 1992;29(4):371-380. *Review.*
1332. Huang PY, Yano EM, Lee ML, Chang BL, Rubenstein LV. Variations in nurse practitioner use in Veterans Affairs primary care practices. Health Serv Res. Aug 2004;39(4 Pt 1):887-904. *Not eligible exposure.*
1333. Huarng F. A primary shift rotation nurse scheduling using zero-one linear goal programming. Comput Nurs. May-Jun 1999;17(3):135-144. *Not eligible target population.*
1334. Huber DA. Staffing issues in the gastroenterology setting. Gastroenterol Nurs. Jan-Feb 2005;28(1):43-44. *Editorial.*
1335. Huch MH. Case management: is it another passing fad? Nurs Sci Q. Jan 2000;13(1):73-74. *Comment.*
1336. Huckabay LM, Tilem-Kessler D. Patterns of parental stress in PICU emergency admission. Dimens Crit Care Nurs. Mar-Apr 1999;18(2):36-42. *Case Reports.*
1337. Hudon PS. Leapfrog standards: implications for nursing practice. Nurs Econ. Sep-Oct 2003;21(5):233-236. *Review.*
1338. Hudson J, Caruthers TE, Lantiegne K. Intensive care nursing requirements: resource allocation according to patient status. Crit Care Med. Feb 1979;7(2):69-75. *Not eligible year.*
1339. Huff C. Workforce. Crossing the U.S. border. Hosp Health Netw. Sep 2004;78(9):24, 26. *News.*
1340. Hughes KK, Marcantonio RJ. Recruitment, retention, and compensation of agency and hospital nurses. J Nurs Adm. Oct 1991;21(10):46-52. *Not eligible outcomes.*
1341. Hughes KK, Marcantonio RJ. The clinical practice of supplemental nursing personnel. Nurs Adm Q. Spring 1993;17(3):83-87. *Not eligible outcomes.*
1342. Hughes KK, Young WB. Decision making: stability of clinical decisions. Nurse educator May-Jun 1992;17(3):12-6. *Not relevant.*
1343. Hughes R, Stone P. The perils of shift work: evening shift, night shift, and rotating shifts: are they for you? Am J Nurs. Sep 2004;104(9):60-63. *Review.*
1344. Humenick SS, Hill PD, Spiegelberg PL. Breastfeeding and health professional encouragement. J Hum Lact. Dec 1998;14(4):305-310. *Not eligible exposure.*
1345. Humm C. Night duty: all night long. Nurs Stand. Aug 17-23 1994;8(47):40. *Comment.*
1346. Humm C. A shift in time. Nurs Stand. Jun 12 1996;10(38):22-24. *Comment.*
1347. Hundley VA, Cruickshank FM, Milne JM, Glazener CM, Lang GD, Turner M, Blyth D, Mollison J. Satisfaction and continuity of care: staff views of care in a midwife-managed delivery unit. Midwifery. Dec 1995;11(4):163-173. *Not eligible target population.*
1348. Hung R. A cyclical schedule of 10-hour, four-day workweeks. Nurs Manage. Sep 1991;22(9):30-33. *Not eligible outcomes.*
1349. Hung R. A note on nurse self-scheduling. Nurs Econ. Jan-Feb 2002;20(1):37-39. *Not eligible target population.*
1350. Hunt J, Hagen S. Nurse to patient ratios and patient outcomes. Nurs Times. Nov 11-17 1998;94(45):63-66. *Not eligible target population.*
1351. Hunt JM. The cardiac surgical patient's expectations and experiences of nursing care in the intensive care unit. Aust Crit Care. Jun 1999;12(2):47-53. *Not eligible target population.*
1352. Hunter PR, Harrison GA, Fraser CA. Cross-infection and diversity of Candida albicans strain carriage in patients and nursing staff on an intensive care unit. J Med Vet Mycol. 1990;28(4):317-325. *Not eligible target population.*
1353. Hupcey JE, Penrod J, Morse JM. Establishing and maintaining trust during acute care hospitalizations. Sch Inq Nurs Pract. Fall 2000;14(3):227-242; discussion 243-228. *Not eligible exposure.*
1354. Hurst I. Vigilant watching over: mothers' actions to safeguard their premature babies in the newborn intensive care nursery. J Perinat Neonatal Nurs. Dec 2001;15(3):39-57. *Not eligible exposure.*
1355. Hurst K. Multi-skilled health carers: nature, purpose and implications. Health Manpow Manage. 1997;23(6):197-211. *Not eligible target population.*
1356. Hurst K. Relationships between patient dependency, nursing workload and quality. Int J Nurs Stud. Jan 2005;42(1):75-84. *Not eligible target population.*
1357. Hwang JL, Desombre T, Eves A, Kipps M. An analysis of catering options within NHS acute hospitals. Int J Health Care Qual Assur Inc Leadersh Health Serv. 1999;12(6-7):293-308. *Not eligible target population.*
1358. Hydes-Greenwood J, Nellestein I, Leach V. Home and away. Successful strategies in recruitment and retention of overseas nurses. Nurs Manag (Harrow). Sep 2002;9(5):26-29. *Not eligible target population.*
1359. Iapichino G, Radrizzani D, Bertolini G, Ferla L, Pasetti G, Pezzi A, Porta F, Miranda DR. Daily classification of the level of care. A method to describe clinical course of illness, use of resources and quality of intensive care assistance. Intensive Care Med. Jan 2001;27(1):131-136. *Not eligible target population.*
1360. Idel M, Melamed S, Merlob P, Yahav J, Hendel T, Kaplan B. Influence of a merger on nurses' emotional well-being: the importance of self-efficacy and emotional reactivity. J Nurs Manag. Jan 2003;11(1):59-63. *Not eligible target population.*
1361. Idelson C. RNs press California to finalize ratios. Hospitals step up attack at public hearings. Revolution. Nov-Dec 2002;3(6):10-12. *News.*

1362. Idelson C. Hospital industry still resisting ratios. Revolution. Jan-Feb 2004;5(1):6. *Comment.*
1363. Idelson C. RNs win court fight, keep ratios. Revolution. May-Jun 2005;6(3):8-9. *News.*
1364. Idvall E, Hamrin E, Sjostrom B, Unosson M. Patient and nurse assessment of quality of care in postoperative pain management. Qual Saf Health Care. Dec 2002;11(4):327-334. *Not eligible target population.*
1365. Ikegami A, Niwa A. A study of nurse scheduling in Japan. J Hum Ergol (Tokyo). Dec 2001;30(1-2):71-76. *Not eligible target population.*
1366. Iliffe J. Campaigning for quality health care. Aust Nurs J. May 2000;7(10):1. *Editorial.*
1367. Ingersoll GL, Brooks AM, Fischer MS, Hoffere DA, Lodge RH, Wigsten KS, Costello D, Hartung DA, Kiernan ME, Parrinello KM, et al. Professional practice model research collaboration. Issues in longitudinal, multisite designs. J Nurs Adm. Jan 1995;25(1):39-46. *No association tested.*
1368. Ingersoll GL, Fisher M, Ross B, et al. Employee response to major organizational redesign. Applied Nursing Research Feb 2001;14(1):18-28. *Not relevant.*
1369. Innis J, Bikaunieks N, Petryshen P, Zellermeyer V, Ciccarelli L. Patient satisfaction and pain management: an educational approach. J Nurs Care Qual. Oct-Dec 2004;19(4):322-327. *Not eligible exposure.*
1370. Inwood H. Knowledge of resuscitation. Intensive Crit Care Nurs. Feb 1996;12(1):33-39. *Not eligible target population.*
1371. Irurita VF. Factors affecting the quality of nursing care: the patient's perspective. Int J Nurs Pract. Jun 1999;5(2):86-94. *Not eligible target population.*
1372. Irurita VF. The problem of patient vulnerability. Collegian. Jan 1999;6(1):10-15. *Not eligible target population.*
1373. Irurita VF, Williams AM. Balancing and compromising: nurses and patients preserving integrity of self and each other. Int J Nurs Stud. Oct 2001;38(5):579-589. *Not eligible target population.*
1374. Irving K. Governing the conduct of conduct: are restraints inevitable? J Adv Nurs. Nov 2002;40(4):405-412. *Not eligible target population.*
1375. Isken MW, Hancock WM. A heuristic approach to nurse scheduling in hospital units with non-stationary, urgent demand, and a fixed staff size. J Soc Health Syst. 1991;2(2):24-41. *No association tested.*
1376. Ito H, Nozaki M, Maruyama T, Kaji Y, Tsuda Y. Shift work modifies the circadian patterns of heart rate variability in nurses. Int J Cardiol. Jul 2001;79(2-3):231-236. *Not eligible target population.*
1377. Itzhaky H, Gerber P, Dekel R. Empowerment, skills, and values: a comparative study of nurses and social workers. Int J Nurs Stud. May 2004;41(4):447-455. *Not eligible target population.*
1378. Iverson J, Kirklin S, Becket N, Stone T, Pesanti L. Premium pay cuts agency costs. J Nurs Adm. Oct 1992;22(10):8, 33. *Comment.*
1379. Iwata N, Ichii S, Egashira K. Effects of bright artificial light on subjective mood of shift work nurses. Ind Health. 1997;35(1):41-47. *Not eligible target population.*
1380. Jabez A. Nursing abroad: a place of extremes. Nurs Stand. Apr 21-27 1993;7(31):18-19. *Comment.*
1381. Jacelon CS. Attitudes and behaviors of hospital staff toward elders in an acute care setting. Appl Nurs Res. Nov 2002;15(4):227-234. *Not eligible exposure.*
1382. Jackson A. Improving staffing and quality: a nursing support team. Paediatr Nurs. Nov 1999;11(9):22-24. *Not eligible target population.*
1383. Jackson AL, Pokorny ME, Vincent P. Relative satisfaction with nursing care of patients with ostomies. J ET Nurs. Nov-Dec 1993;20(6):233-238. *Not eligible exposure.*
1384. Jackson BS, Kasoff J, Casavis L, Hoffmeister R. Raising the bar and keeping it there. J Nurs Adm. Mar 2003;33(3):134-135. *Comment.*
1385. Jackson BS, Robley LR, Cortes TA, Annella EJ. How far do we go to protect patient welfare? Breaching unit staff confidentiality and trust. J Nurs Adm. Jun 1997;27(6):7-9. *Comment.*
1386. Jackson L. Nurs/patient ratio too high. Nursing. Dec 1991;21(12):6. *Letter.*
1387. Jackson LB, Marcell J, Benedict S. Nurses' attitudes toward parental visitation on the postanesthesia care unit. J Perianesth Nurs. Feb 1997;12(1):2-6. *Not eligible outcomes.*
1388. Jackson M. A preceptor incentive program. Am J Nurs. Jun 2001;101(6):24A-24C, 24E. *Comment.*
1389. Jackson NV. A survey of part-time faculty in baccalaureate schools of nursing and their learning needs. *Not relevant.*
1390. Jackson TL, Beun L. A prospective study of cost, patient satisfaction, and outcome of treatment of chalazion by medical and nursing staff. Br J Ophthalmol. Jul 2000;84(7):782-785. *Not eligible target population.*
1391. Jacobs C. How to plan for times of high patient census. Nurs Manage. May 2002;33(5):46, 48-51. *Comment.*
1392. Jacobs L. 'Saint B' gets an A in ratios. Revolution. Jan-Feb 2004;5(1):22-26. *Comment.*
1393. Jacobsen C, Holson D, Farley J, Charles J, Suel P. Surviving the perfect storm: staff perceptions of mandatory overtime. JONAS Healthc Law Ethics Regul. Sep 2002;4(3):57-66. *Not eligible exposure.*
1394. Jacobson AK, Seltzer JE, Dam EJ. New methodology for analyzing fluctuating unit activity. Nurs Econ. Jan-Feb 1999;17(1):55-59. *Not eligible outcomes.*
1395 Jacobson SF, Jordan KF. Nurses' reasons for participating in a longitudinal panel survey. West J Nurs Res. Aug 1993;15(4):509-515. *Not eligible outcomes.*
1396. Jaklevic MC. Law allows some hiring of foreign nurses. Mod Healthc. Nov 29 1999;29(48):38. *News.*
1397. Jakob SM, Rothen HU. Intensive care 1980-1995: change in patient characteristics, nursing workload and outcome. Intensive Care Med. Nov 1997;23(11):1165-1170. *Not eligible target population.*

1398. James DV, Fineberg NA, Shah AK, Priest RG. An increase in violence on an acute psychiatric ward. A study of associated factors. Br J Psychiatry. Jun 1990;156:846-852. *Not eligible target population.*
1399. James G. Nursing precious resources. Health Serv J. May 16 1991;101(5252):24-25. *Not eligible target population.*
1400. Jannotta M, Maldonado T. Self-management for nurses. J Nurs Adm. Jun 1992;22(6):59-63. *No association tested.*
1401. Janssen PA, Keen L, Soolsma J, Seymour LC, Harris SJ, Klein MC, Reime B. Perinatal nursing education for single-room maternity care: an evaluation of a competency-based model. J Clin Nurs. Jan 2005;14(1):95-101. *Not eligible exposure.*
1402. Jarman H, Jacobs E, Zielinski V. Medication study supports registered nurses' competence for single checking. Int J Nurs Pract. Dec 2002;8(6):330-335. *Not eligible target population.*
1403. Jarvi M, Uusitalo T. Job rotation in nursing: a study of job rotation among nursing personnel from the literature and via a questionnaire. J Nurs Manag. Sep 2004;12(5):337-347. *Not eligible target population.*
1404. Jarvis LA, Beale B, Martin K. A client-centered model: discharge planning in Juvenile Justice Centres in New South Wales, Australia. Int Nurs Rev. Sep 2000;47(3):184-190. *Not eligible target population.*
1405. Jarvis R, Young SW, Hardy P, Ward S. Implementation of a patient classification system: using current resources to achieve organizational goals. Health Care Superv. Sep 1991;10(1):51-57. *No association tested.*
1406. Jaworski Miller L, Corbett G, Herold M, Tavares D, Kirchner L, Heath J. Journey to the Beacon Award: the Georgetown University Hospital perspective. Crit Care Nurs Clin North Am. Jun 2005;17(2):155-161, x. *Review.*
1407. Jeang A. Flexible nursing staff planning when patient demands are uncertain. J Med Syst. Jun 1994;18(3):125-138. *Not eligible target population.*
1408. Jeang A. Flexible nursing staff planning with adjustable patient demands. J Med Syst. Aug 1996;20(4):173-182. *Not eligible target population.*
1409. Jeffe DB, Dunagan WC, Garbutt J, Burroughs TE, Gallagher TH, Hill PR, Harris CB, Bommarito K, Fraser VJ. Using focus groups to understand physicians' and nurses' perspectives on error reporting in hospitals. Jt Comm J Qual Saf. Sep 2004;30(9):471-479. *Not eligible exposure.*
1410. Jenkins CG. (Relatively) painless downsizing. MLO Med Lab Obs. Mar 1996;28(3):36-39. *Comment.*
1411. Jenkins LS, George V. Heart Watch: national survey of continuous electrocardiographic monitoring in U.S. hospitals. J Nurs Adm. Apr 1995;25(4):38-44. *Not eligible exposure.*
1412. Jenkins R, Elliott P. Stressors, burnout and social support: nurses in acute mental health settings. J Adv Nurs. Dec 2004;48(6):622-631. *Not eligible target population.*
1413. Jennings BM. The role of research in the policy puzzle: nurse staffing research as a case in point. Res Nurs Health. Dec 2001;24(6):443-445. *Editorial.*
1414. Jennings BM, Loan LA, DePaul D, Brosch LR, Hildreth P. Lessons learned while collecting ANA indicator data. J Nurs Adm. Mar 2001;31(3):121-129. *Review.*
1415. Jensen L. Self-administered cardiac medication program evaluation. Can J Cardiovasc Nurs. 2003;13(2):35-44. *Not eligible target population.*
1416. Jeppesen HJ, Boggild H. Management of health and safety in the organization of worktime at the local level. Scand J Work Environ Health. 1998;24 Suppl 3:81-87. *Not eligible target population.*
1417. Jerant AF, Azari R, Martinez C, Nesbitt TS. A randomized trial of telenursing to reduce hospitalization for heart failure: patient-centered outcomes and nursing indicators. Home Health Care Serv Q. 2003;22(1):1-20. *Not eligible exposure.*
1418. Jette DU, Warren RL, Wirtalla C. Rehabilitation in skilled nursing facilities: effect of nursing staff level and therapy intensity on outcomes. Am J Phys Med Rehabil. Sep 2004;83(9):704-712. *Not eligible target population.*
1419. Jevitt CM, Beckstead JW. Retirement among Florida's certified nurse-midwives: an impending workforce crisis. Journal of midwifery & women's health Jan-Feb 2004;49(1):39-46. *Not relevant.*
1420. Jickling JL, Graydon JE. The information needs at time of hospital discharge of male and female patients who have undergone coronary artery bypass grafting: a pilot study. Heart Lung. Sep-Oct 1997;26(5):350-357. *Not eligible exposure.*
1421. Jinks A, Smith M, Ashdown-Lambert J. The public health roles of health visitors and school nurses: a survey. Br J Community Nurs. Nov 2003;8(11):496-501. *Not eligible target population.*
1422. Johanson W. Nurse staffing. Health Aff (Millwood). Jan-Feb 2003;22(1):281; author reply 281-282. *Comment.*
1423. Johansson P, Oleni M, Fridlund B. Nurses' assessments and patients' perceptions: development of the Night Nursing Care Instrument (NNCI), measuring nursing care at night. Int J Nurs Stud. Jul 2005;42(5):569-578. *Not eligible target population.*
1424. Johnson DE. Hospitals can control patient days to stem nurse demand. Health Care Strateg Manage. Jul 2001;19(7):1, 18-19. *Comment.*
1425. Johnson DE. Leapfrog's report is incomplete, misleading. Health Care Strateg Manage. Feb 2002;20(2):2-3. *Review.*
1426. Johnson DE. How severe is the nurse shortage? Health Care Strateg Manage. Jan 2003;21(1):2-3. *Comment.*
1427. Johnson F, Smithson S. International recruitment. Travellers' checks. Health Serv J. Jul 4 2002;112(5812):25. *News.*
1428. Johnson J, Brown KK, Neal K. Designs that make a difference: the Cardiac Universal Bed model. J Cardiovasc Manag. Sep-Oct 2003;14(5):16-20. *No association tested.*
1429. Johnson JE. Management perspectives. I am a nursing executive in an institution whose goal is to change its culture to become more customer oriented. Nurs Spectr (Wash D C). Aug 7 1995;5(16):5. *Comment.*

1430. Johnson LJ. Your liability for a nurse's mistake. Med Econ. Sep 9 2002;79(17):115. *Comment.*
1431. Johnson M, Stewart H, Langdon R, Kelly P, Yong L. Women-centred care and caseload models of midwifery. Collegian. Jan 2003;10(1):30-34. *Not eligible target population.*
1432. Johnson N. Congressional outlook: nursing shortages. Hosp Outlook. Feb 2001;4(2):7. *Comment.*
1433. Johnson SH. The right balance. Dimens Crit Care Nurs. Jan-Feb 1996;15(1):2-3. *Editorial.*
1434. Johnson SH. Coping with census fluctuations. Nurs Manage. Oct 1998;29(10):48L. *Comment.*
1435. Johnston CL. Changing care patterns and registered nurse job satisfaction. Holist Nurs Pract. Apr 1997;11(3):69-77. *Review.*
1436. Johnstone L. Mental health. In the same boat? Nurs Times. Jul 7-13 1993;89(27):30-31. *Comment.*
1437. Jolley S. Promoting teenage sexual health: an investigation into the knowledge, activities and perceptions of gynaecology nurses. J Adv Nurs. Oct 2001;36(2):246-255. *Not eligible target population.*
1438. Jones A. Perceptions on individualized approaches to mental health care. J Psychiatr Ment Health Nurs. Aug 2005;12(4):396-404. *Not eligible target population.*
1439. Jones CB. The costs of nurse turnover, part 2: application of the Nursing Turnover Cost Calculation Methodology. J Nurs Adm. Jan 2005;35(1):41-49. *Not eligible outcomes.*
1440. Jones D. I am that agency nurse. Accid Emerg Nurs. Jan 1998;6(1):51-52. *Comment.*
1441. Jones GJ, Vanderpump MP, Easton M, Baker DM, Ball C, Leenane M, O'Brien H, Turner N, Else M, Reid WM, Johnson M. Achieving compliance with the European Working Time Directive in a large teaching hospital: a strategic approach. Clin Med. Sep-Oct 2004;4(5):427-430. *Not eligible target population.*
1442. Jones HE, Cleave B, Zinman B, Szalai JP, Nichol HL, Hoffman BR. Efficacy of feedback from quarterly laboratory comparison in maintaining quality of a hospital capillary blood glucose monitoring program. Diabetes Care. Feb 1996;19(2):168-170. *Not eligible exposure.*
1443. Jones IH. Night moves. Nurs Times. May 2-8 1990;86(18):21. *Comment.*
1444. Jones J, Black N, Sanderson C. Levels of nurse staffing. Sr Nurse. Jan-Feb 1993;13(1):20-24. *Comment.*
1445. Jones J, Ward M, Wellman N, Hall J, Lowe T. Psychiatric inpatients' experience of nursing observation. A United Kingdom perspective. J Psychosoc Nurs Ment Health Serv. Dec 2000;38(12):10-20. *Not eligible target population.*
1446. Jones JS, Holstege CP, Riekse R, White L, Bergquist T. Metered-dose inhalers: do emergency health care providers know what to teach? Ann Emerg Med. Sep 1995;26(3):308-311. *Not eligible exposure.*
1447. Jones K, Yancer DA, McGinley SJ, Galbraith P. An agency-staffed nursing unit project. Nurs Manage. Oct 1990;21(10):36-37, 40. *No association tested.*
1448. Jones M. Stress and burnout in nursing: causes and prevention. Okla Nurse. Apr-Jun 1996;41(2):20-21. *Comment.*
1449. Jones S. Managing pain using the partnership model of care. Paediatr Nurs. Feb 1995;7(1):21-24. *No association tested.*
1450. Jordan C, Tabone S. Mandatory overtime and on call: growing concerns for nurses. Tex Nurs. Sep 2000;74(8):4-6. *Comment.*
1451. Jordan CB. Nurse staffing: are the answers emerging? Tex Nurs. May 2000;74(5):4-5, 15. *Comment.*
1452. Jordan CB. Preparing for the 2001 Texas Legislative session. Nurse staffing. What's adequate? What's safe? Tex Nurs. Feb 2000;74(2):4-5, 10. *Comment.*
1453. Jorde R, Nordoy A. Improvement in clinical work through feedback: intervention study. Bmj. Jun 26 1999;318(7200):1738-1739. *Not eligible target population.*
1454. Joseph HJ. Attitudes and cultural self-efficacy levels of nurses caring for patients in army hospitals. J Natl Black Nurses Assoc. Jul 2004;15(1):5-16. *Not eligible target population.*
1455. Jung FD, Pearcey LG, Phillips JL. Evaluation of a program to improve nursing assistant use. J Nurs Adm. Mar 1994;24(3):42-47. *Not eligible exposure*.
1456. Junger A, Brenck F, Hartmann B, Klasen J, Quinzio L, Benson M, Michel A, Rohrig R, Hempelmann G. Automatic calculation of the nine equivalents of nursing manpower use score (NEMS) using a patient data management system. Intensive Care Med. Jul 2004;30(7):1487-1490. *Not eligible target population.*
1457. Kafkia T, Kourakos M, Lagkazali B, Eleftheroudi M, Tsougia P, Doula M, Laskari A, Thanassa G, De Vos JY, Elseviers M. European practice database: results from Greece. Edtna Erca J. Jan-Mar 2005;31(1):43-48. *Not eligible target population.*
1458. Kageyama T, Kobayashi T, Nishikido N, Oga J, Kawashima M. Associations of sleep problems and recent life events with smoking behaviors among female staff nurses in Japanese hospitals. Ind Health. Jan 2005;43(1):133-141. *Not eligible target population.*
1459. Kageyama T, Nishikido N, Kobayashi T, Oga J, Kawashima M. Cross-sectional survey on risk factors for insomnia in Japanese female hospital nurses working rapidly rotating shift systems. J Hum Ergol (Tokyo). Dec 2001;30(1-2):149-154. *Not eligible target population.*
1460. Kaissi A, Johnson T, Kirschbaum MS. Measuring teamwork and patient safety attitudes of high-risk areas. Nurs Econ. Sep-Oct 2003;21(5):211-218, 207. *Not eligible exposure.*
1461. Kamineni S, Higgins A, Edmunds C. Specialist surgical nursing assistant. Br J Hosp Med. Feb 5-18 1997;57(3):112. *Letter.*
1462. Kandolin I, Huida O. Individual flexibility: an essential prerequisite in arranging shift schedules for midwives. J Nurs Manag. Jul 1996;4(4):213-217. *Not eligible target population.*
1463. Kane D. Job sharing as a part-time employment alternative. J Nurs Adm. Mar 1995;25(3):5, 33. *Comment.*

1464. Kane D. Job sharing: a retention strategy for nurses. Can J Nurs Leadersh. Nov-Dec 1999;12(4):16-22. *Not eligible exposure.*
1465. Kane-Urrabazo C. Should you dive into that float assignment? Nursing. Jun 2004;34(6):64. *Comment.*
1466. Kangas S, Kee CC, McKee-Waddle R. Organizational factors, nurses' job satisfaction, and patient satisfaction with nursing care. J Nurs Adm. Jan 1999;29(1):32-42. *Not eligible exposure.*
1467. Kanji Z. Implementation of a sedation and analgesia scale. J Nurs Care Qual. Jan-Mar 2005;20(1):13-15. *Not eligible exposure*.
1468. Kany K. How can nurses combat mandatory overtime? Am J Nurs. Aug 1999;99(8):77. *Comment.*
1469. Kany K. Combating staffing problems. Am J Nurs. Apr 1999;99(4):68. *Comment.*
1470. Kany K. Policy vs. reality. Am J Nurs. May 2001;101(5):87. *Comment.*
1471. Kaplan M. Hospital caregivers are in a bad mood. Am J Nurs. Mar 2000;100(3):25. *Comment.*
1472. Kaplow R. AACN Synergy Model for Patient Care: a framework to optimize outcomes. Crit Care Nurse. Feb 2003;Suppl:27-30. *Review.*
1473. Kaprowy J, Schilder E. Restraint or martial arts: should nurses tie people down? Ky Hosp Mag. Winter 1991;8(1):12-16. *Comment.*
1474. Karadeniz G, Cakmakci A. Nurses' perceptions of medication errors. Int J Clin Pharmacol Res. 2002;22(3-4):111-116. *Not eligible target population.*
1475. Karas C. RN staffing is key. Hosp Health Netw. Aug 2001;75(8):16. *Comment.*
1476. Karch AM, Karch FE. What did you say? I can't quite understand your spoken order. Am J Nurs. Aug 1999;99(8):12. *Case Reports.*
1477. Karch AM, Karch FE. The naked decimal point. And eight other common errors that can be avoided. Am J Nurs. Dec 2001;101(12):22. *Case Reports.*
1478. Kardos L, Szeles G, Gombkoto G, Szeremi M, Tompa A, Adany R. Cancer deaths among hospital staff potentially exposed to ethylene oxide: an epidemiological analysis. Environ Mol Mutagen. 2003;42(1):59-60. *Not eligible target population.*
1479. Karkkainen O, Eriksson K. Recording the content of the caring process. J Nurs Manag. May 2005;13(3):202-208. *Not eligible target population.*
1480. Karlowicz MG, McMurray JL. Comparison of neonatal nurse practitioners' and pediatric residents' care of extremely low-birth-weight infants. Arch Pediatr Adolesc Med. Nov 2000;154(11):1123-1126. *Not eligible exposure*.
1481. Kater V, Braverman N, Chuwers P. Would provision of childcare for nurses with young children ensure response to a call-up during a wartime disaster? An Israeli hospital nursing survey. Public Health Rev. 1992;20(3-4):313-316. *Not eligible exposure.*
1482. Kauffmann E, Harrison MB, Burke SO, Wong C. Stress-point intervention for parents of children hospitalized with chronic conditions. Pediatr Nurs. Jul-Aug 1998;24(4):362-366. *Not eligible exposure.*
1483. Kautzman L, Miller LH. Growing replacements for our 'graying' perioperative nurses. Todays Surg Nurse. Mar-Apr 1999;21(2):22-25. *Comment.*
1484. Kavanaugh K, Engstrom JL, Meier PP, Lysakowski TY. How reliable are scales for weighing preterm infants? Neonatal Netw. Oct 1990;9(3):29-32. *Not eligible exposure.*
1485. Kawik L. Nurses' and parents' perceptions of participation and partnership in caring for a hospitalized child. Br J Nurs. Apr 11-24 1996;5(7):430-437. *Not eligible target population.*
1486. Kaya S, Vural G, Eroglu K, Sain G, Mersin H, Karabeyoglu M, Sezer K, Turkkani B, Restuccia JD. Liability and validity of the Appropriateness Evaluation Protocol in Turkey. Int J Qual Health Care. Aug 2000;12(4):325-329. *Not eligible target population.*
1487. Kaye W, Mancini ME, Giuliano KK, Richards N, Nagid DM, Marler CA, Sawyer-Silva S. Strengthening the in-hospital chain of survival with rapid defibrillation by first responders using automated external defibrillators: training and retention issues. Ann Emerg Med. Feb 1995;25(2):163-168. *Not eligible exposure.*
1488. Kayuha AA. Acclimating to shift work--a survival kit. Healthc Trends Transit. Apr 1990;1(5):18, 20, 22-15. *No association tested.*
1489. Keatinge D, Gilmore V. Shared care: a partnership between parents and nurses. Aust J Adv Nurs. Sep-Nov 1996;14(1):28-36. *Not eligible target population.*
1490. Keddy B, Gregor F, Foster S, et al. Theorizing about nurses' work lives: the personal and professional aftermath of living with healthcare 'reform'. Nursing inquiry Mar 1999;6(1):58-64. *Not relevant.*
1491. Keenan GM, Cooke R, Hillis SL. Norms and nurse management of conflicts: keys to understanding nurse-physician collaboration. Res Nurs Health. Feb 1998;21(1):59-72. *Not eligible exposure.*
1492. Keim J, Robinson S. Work environment factors influencing burnout among third shift nurses. J Nurs Adm. Nov 1992;22(11):52, 56. *Comment.*
1493. Keller KL. The management of stress and prevention of burnout in emergency nurses. J Emerg Nurs. Mar-Apr 1990;16(2):90-95. *Not eligible exposure.*
1494. Keller LO, Strohschein S, Lia-Hoagberg B, Schaffer M. Population-based public health nursing interventions: a model from practice. Public Health Nurs. Jun 1998;15(3):207-215. *Not eligible exposure.*
1495. Kellett J. Taking the blame. Nurs Stand. Dec 11 1996;11(12):21-23. *Not eligible target population.*
1496. Kelley LS, Swanson E, Maas ML, Tripp-Reimer T. Family visitation on special care units. J Gerontol Nurs. Feb 1999;25(2):14-21. *Not eligible exposure*.
1497. Kelly AM. Nurse-managed analgesia for renal colic pain in the emergency department. Aust Health Rev. 2000;23(2):185-189. *Not eligible target population.*
1498. Kelly AM, Miljesic S, Mant P, Ashton W. Plaster checks by nurses: safe and efficient? Accid Emerg Nurs. Apr 1996;4(2):76-77. *Not eligible exposure.*
1499. Kelly B. Hospital nursing: 'it's a battle!' A follow-up study of English graduate nurses. J Adv Nurs. Nov 1996;24(5):1063-1069. *No association tested.*

1500. Kelly M, Williams C, Murdoch I. Comparison of costing tools in paediatric intensive care. Paediatr Nurs. Nov 1999;11(9):14-16. *Not eligible target population.*
1501. Kelly TM, Donovan K. Cardiac rehabilitation in the time of health-care reform. AACN Clin Issues. Aug 1995;6(3):432-442. *Not eligible exposure*.
1502. Kemper KJ, Benson MS, Bishop MJ. Interobserver variability in assessing pediatric postextubation stridor. Clin Pediatr (Phila). Jul 1992;31(7):405-408. *Not eligible exposure*.
1503. Kemppainen JK, Dubbert PM, McWilliams P. Effects of group discussion and guided patient care experience on nurses' attitudes towards care of patients with AIDS. J Adv Nurs. Aug 1996;24(2):296-302. *Not eligible target population.*
1504. Kendig EL, Jr., Kirkpatrick BV, Carter WH, Hill FA, Caldwell K, Entwistle M. Underreading of the tuberculin skin test reaction. Chest. May 1998;113(5):1175-1177. *Not eligible exposure*.
1505. Kenney PA. Maintaining quality care during a nursing shortage using licensed practical nurses in acute care. J Nurs Care Qual. Jul 2001;15(4):60-68. *Not eligible exposure*.
1506. Kenny MF, Gapas J, Hilton G. Cross utilization in critical care. Nurs Manage. May 1995;26(5):48D, 48F-48I. *No association tested.*
1507. Kenny P, King MT, Cameron S, Shiell A. Satisfaction with postnatal care--the choice of home or hospital. Midwifery. Sep 1993;9(3):146-153. *Not eligible exposure.*
1508. Keogh A, Dealey C. Profiling beds versus standard hospital beds: effects on pressure ulcer incidence outcomes. J Wound Care. Feb 2001;10(2):15-19. *Not eligible exposure.*
1509. Kercher LL. Appropriate staffing: our right, our responsibility. Nurs Manage. Feb 1999;30(2):4. *Editorial.*
1510. Kerfoot KM, Cox M. The synergy model: the ultimate mentoring model. Crit Care Nurs Clin North Am. Jun 2005;17(2):109-112, ix. *Comment.*
1511. Kern D, Kettner P, Albrizio M. An exploration of the variables involved when instituting a do-not-resuscitate order for patients undergoing bone marrow transplantation. Oncol Nurs Forum. May 1992;19(4):635-640. *Not eligible exposure.*
1512. Kerr MP. A qualitative study of shift handover practice and function from a socio-technical perspective. J Adv Nurs. Jan 2002;37(2):125-134. *Not eligible target population.*
1513. Kester-Beaver P. Tales from travelers. Am J Nurs. Apr 1991;91(4):50-56. *Comment*.
1514. Ketter J. Have you worked through lunch lately? Fair Labor Standards Act protectsRNs against wage abuse. Am Nurse. Jul-Aug 1995;27(5):14. *Comment.*
1515. Ketter J. ANA and SNAs tackle hospital restructuring. Am Nurse. Mar 1995;27(2):8, 18. *Comment.*
1516. Khan ZU, Chandy R, Metwali KE. Candida albicans strain carriage in patients and nursing staff of an intensive care unit: a study of morphotypes and resistotypes. Mycoses. Dec 2003;46(11-12):479-486. *Not eligible target population.*
1517. Kidner MC. How to keep float nurses from sinking. Rn. Sep 1999;62(9):35-39. *Comment.*
1518. Kiekkas P, Poulopoulou M, Papahatzi A, Androutsopoulou C, Maliouki M, Prinou A. Workload of postanaesthesia care unit nurses and intensive care overflow. Br J Nurs. Apr 28-May 11 2005;14(8):434-438. *Not eligible target population.*
1519. Killeen MB. A system with many methods to adjust staffing. Mich Nurse. Sep 2004:13-15. *Comment.*
1520. Kinard J, Little B. Are hospitals facing a critical shortage of skilled workers? Health Care Superv. Jun 1999;17(4):54-62. *No association tested.*
1521. King LA, Wasdovich A, Young C. Transforming nursing practice: clinical systems and the nursing unit of the future. J Healthc Inf Manag. Summer 2004;18(3):32-36. *Not eligible exposure.*
1522. King RB, Shaw K, Adams JG. ED overcrowding-meeting many needs. Pediatr Emerg Care. Oct 2004;20(10):710-716. *Interview.*
1523. King S. Goodbye Holladay Park. Oreg Nurse. Sep 1994;59(3):3. *Comment.*
1524. King S. Hospital nurse staffing--the public's interest. Oreg Nurse. Sep 1999;64(3):3. *Comment.*
1525. King S. Safe staffing levels for children's wards. Paediatr Nurs. Mar 2000;12(2):28-31. *No association tested.*
1526. King S. Hospital staffing law effective Oct. 1. Oreg Nurse. Sep 2002;67(3):1, 8. *Legal Cases.*
1527. Kinley H, Czoski-Murray C, George S, McCabe C, Primrose J, Reilly C, Wood R, Nicolson P, Healy C, Read S, Norman J, Janke E, Alhameed H, Fernandes N, Thomas E. Effectiveness of appropriately trained nurses in preoperative assessment: randomised controlled equivalence/non-inferiority trial. Bmj. Dec 7 2002;325(7376):1323. *Not eligible target population.*
1528. Kinley H, Czoski-Murray C, George S, McCabe C, Primrose J, Reilly C, Wood R, Nicolson P, Healy C, Read S, Norman J, Janke E, Alhameed H, Fernandez N, Thomas E. Extended scope of nursing practice: a multicentre randomised controlled trial of appropriately trained nurses and pre-registration house officers in pre-operative assessment in elective general surgery. Health Technol Assess. 2001;5(20):1-87. *Not eligible target population.*
1529. Kinn S, Scott J. Nutritional awareness of critically ill surgical high-dependency patients. Br J Nurs. Jun 14-27 2001;10(11):704-709. *Not eligible target population.*
1530. Kinney M. Flexible scheduling and part-time work: what price do we pay? Focus Crit Care. Dec 1990;17(6):439. *Editorial.*
1531. Kinrade S. Acting against discrimination. Prof Nurse. Aug 2003;18(12):714-715. *Not eligible target population.*

1532. Kirby KK, Garfink CM. The University Hospital Nurse Extender Model. Part I, An overview and conceptual framework. J Nurs Adm. Jan 1991;21(1):25-30. *Not eligible target population.*
1533. Kirchhoff KT, Beckstrand RL. Critical care nurses' perceptions of obstacles and helpful behaviors in providing end-of-life care to dying patients. Am J Crit Care. Mar 2000;9(2):96-105. *Not eligible exposure.*
1534 .Kirchhoff KT, Mateo MA. Roles and responsibilities of clinical nurse researchers. J Prof Nurs. Mar-Apr 1996;12(2):86-90. *Not eligible exposure.*
1535. Kirkhart DG. Shared care: improving health care, reducing costs. Nurs Manage. Jun 1995;26(6):26, 28, 30 passim. *Not eligible exposure.*
1536. Kirsch E, Talbott J. Outpatient and short-stay patient classification systems. Nurs Manage. Sep 1990;21(9):118-119, 122. *No association tested.*
1537. Kitajima T, Ohida T, Harano S, Kamal AM, Takemura S, Nozaki N, Kawahara K, Minaowa M. Smoking behavior, initiating and cessation factors among Japanese nurses: a cohort study. Public Health. Nov 2002;116(6):347-352. *Not eligible target population.*
1538. Kivimaki M, Makinen A, Elovainio M, Vahtera J, Virtanen M, Firth-Cozens J. Sickness absence and the organization of nursing care among hospital nurses. Scand J Work Environ Health. Dec 2004;30(6):468-476; quiz 476. *Not eligible target population.*
1539. Kjellberg K, Lagerstrom M, Hagberg M. Patient safety and comfort during transfers in relation to nurses' work technique. J Adv Nurs. Aug 2004;47(3):251-259. *Not eligible target population.*
1540. Kleinbeck SV, McKennett M. Challenges of measuring intraoperative patient outcomes. Aorn J. Nov 2000;72(5):845-850, 853. *No association tested.*
1541. Kleinman C. The relationship between managerial leadership behaviors and staff nurse retention. Hosp Top. Fall 2004;82(4):2-9. *Not eligible outcomes.*
1542. Kluska KM, Laschinger HK, Kerr MS. Staff nurse empowerment and effort-reward imbalance. Can J Nurs Leadersh. Mar 2004;17(1):112-128. *Not eligible exposure.*
1543. Knight P, Cassady G. Control of infection due to Klebsiella pneumoniae in an intensive care nursery. J Perinatol. Dec 1990;10(4):357-360. *Not eligible exposure.*
1544. Kobylus K. Innovations, local solutions arise from the shortage. Healthtexas. Mar 1991;46(9):15-16. *comment.*
1545. Koch F. Staffing outcomes: skill mix changes. Semin Perioper Nurs. Jan 1996;5(1):32-35. *No association tested.*
1546. Koenig HG, Bearon LB, Hover M, Travis JL, 3rd. Religious perspectives of doctors, nurses, patients, and families. J Pastoral Care. Fall 1991;45(3):254-267. *Not eligible exposure.*
1547. Koivisto K, Janhonen S, Vaisanen L. Patients' experiences of being helped in an inpatient setting. J Psychiatr Ment Health Nurs. Jun 2004;11(3):268-275. *Not eligible target population.*
1548. Koivula M, Paunonen M, Laippala P. Prerequisites for quality improvement in nursing. J Nurs Manag. Nov 1998;6(6):333-342. *Not eligible target population.*
1549. Kollee I, Pearson E. Hemodialysis teaching protocols: an educational tool for both patients and nurses. Cannt J. Apr-Jun 2000;10(2):26-29. *Not eligible exposure.*
1550. Kollef MH, Shapiro SD, Silver P, St John RE, Prentice D, Sauer S, Ahrens TS, Shannon W, Baker-Clinkscale D. A randomized, controlled trial of protocol-directed versus physician-directed weaning from mechanical ventilation. Crit Care Med. Apr 1997;25(4):567-574. *Not eligible exposure.*
1551. Koncar DR. A day in the life ... sudden shifts. Debbie Cuaresma, RN cardiac nurse. Revolution. Nov-Dec 2001;2(6):18-21. *Interview.*
1552. Kooijman CJ, Klaassen-Leil CC. Extraction, preparation, and presentation of patient classification-data for the benefit of management overviews. Medinfo. 1995;8 Pt 2:1382-1385. *Not eligible target population.*
1553. Korst LM, EusebioAngeja AC, Chamorro T, et al. Nursing documentation time during implementation of an electronic medical record. Journal of Nursing Administration Jan 2003;33(1):24-30. *Not relevant*.
1554. Kosgeroglu N, Ayranci U, Vardareli E, Dincer S. Occupational exposure to hepatitis infection among Turkish nurses: frequency of needle exposure, sharps injuries and vaccination. Epidemiol Infect. Jan 2004;132(1):27-33. *Not eligible target population.*
1555. Kosowsky JM, Shindel S, Liu T, Hamilton C, Pancioli AM. Can emergency department triage nurses predict patients' dispositions? Am J Emerg Med. Jan 2001;19(1):10-14. *Not eligible exposure.*
1556. Kovner C, Stave CM, Lavelle K, et al. An analysis of vacancy rates, turnover, and wages among nursing occupations in New York state hospitals, nursing homes, and diagnostic and treatment facilities. Journal of the New York State Nurses Association Sep 1994;25(3):20-7. *Not peer reviewed.*
1557. Kovner CT. State regulation of RN-to-patient ratios. Am J Nurs. Nov 2000;100(11):61-63, 65. *Review.*
1558. Kovner CT, Harrington C. The changing picture of hospital nurses. Am J Nurs. May 2002;102(5):93-94. *Review.*
1559. Kramer M, Schmalenberg C. Job satisfaction and retention. Insights for the '90s. Part 2. Nursing. Apr 1991;21(4):51-55. *Not eligible exposure.*
1560. Kramer M, Schmalenberg C. Development and evaluation of essentials of magnetism tool. J Nurs Adm. Jul-Aug 2004;34(7-8):365-378. *Not eligible exposure.*
1561. Kramer M, Schmalenberg C. Revising the Essentials of Magnetism tool: there is more to adequate staffing than numbers. J Nurs Adm. Apr 2005;35(4):188-198. *Not eligible exposure.*
1562. Kramer M, Schmalenberg C, Maguire P. Essentials of a magnetic work environment: part 3. Nursing. Aug 2004;34(8):44-47. *Not eligible exposure.*

1563. Kreplick J. Unlicensed hospital assistive personnel: efficiency or liability? J Health Hosp Law. Sep-Oct 1995;28(5):292-309. *Review.*
1564. Krishnasamy M. What do cancer patients identify as supportive and unsupportive behaviour of nurses? A pilot study. Eur J Cancer Care (Engl). Jun 1996;5(2):103-110. *Not eligible exposure.*
1565. Kristensson-Hallstrom I. Strategies for feeling secure influence parents' participation in care. J Clin Nurs. Sep 1999;8(5):586-592. *Not eligible target population.*
1566. Kromhout H, Hoek F, Uitterhoeve R, Huijbers R, Overmars RF, Anzion R, Vermeulen R. Postulating a dermal pathway for exposure to anti-neoplastic drugs among hospital workers. Applying a conceptual model to the results of three workplace surveys. Ann Occup Hyg. Oct 2000;44(7):551-560. *Not eligible target population.*
1567. Kroposki M, Murdaugh CL, Tavakoli AS, Parsons M. Role clarity, organizational commitment, and job satisfaction during hospital reengineering. Nursingconnections. Spring 1999;12(1):27-34. *Not eligible exposure.*
1568. Krugman M, Smith V. Charge nurse leadership development and evaluation. J Nurs Adm. May 2003;33(5):284-292. *Not eligible exposure.*
1569. Ksykiewicz-Dorota A. Development of nursing time standards as a problem of optimalisation of health care system management. II. Comparative analysis of demand for nursing care. Ann Univ Mariae Curie Sklodowska [Med]. 1999;54:87-96. *Not eligible target population.*
1570. Ksykiewicz-Dorota A. Development of nursing time standards as a problem of optimalisation of health care system management. I. Evaluation of the correctness of patients' classification. Ann Univ Mariae Curie Sklodowska [Med]. 1999;54:79-86. *Not eligible target population.*
1571. Ksykiewicz-Dorota A, Wysokinski M. Special characteristics of nursing staff scheduling in intensive care units. Ann Univ Mariae Curie Sklodowska [Med]. 2001;56:313-318. *Not eligible target population.*
1572. Kubecka KE, Simon JM, Boettcher JH. Pain management knowledge of hospital-based nurses in a rural Appalachian area. J Adv Nurs. May 1996;23(5):861-867. *Not eligible exposure.*
1573. Kubisiak J. Is this midwifery? Midwifery Today Int Midwife. Summer 1998(46):42. *Comment.*
1574. Kuhn EM, Hartz AJ, Gottlieb MS, Rimm AA. The relationship of hospital characteristics and the results of peer review in six large states. Med Care. Oct 1991;29(10):1028-1038. *Not eligible exposure*.
1575. Kumarich D, Biordi DL, Milazzo-Chornick N. The impact of the 23-hour patient on nursing workload. J Nurs Adm. Nov 1990;20(11):47-52. *Not eligible exposure.*
1576. Kupferman K. 10 ways to help students grow. Nursing. Apr 2005;35(4):56. *Comment.*
1577. Kurian VA. Life-style impact for Christ. Christ Nurse Int. 1995;11(3):5. *Comment.*
1578. Kutash MB, Nelson D. Optimizing the use of nursing pool resources. J Nurs Adm. Jan 1993;23(1):65-68. *No association tested.*
1579. Kydd A. Education and training in dementia care. Community Nurse. Jan 2000;5(12):15-16. *Comment.*
1580. Kyle F. Your shift penalties under attack. Aust Nurses J. Apr 1990;19(9):10-11. *Not eligible target population.*
1581. Lacombe DC. Avoiding a malpractice nightmare. Nursing. Jun 1990;20(6):42-43. *Case Reports.*
1582. Lacovara JE. Does your acuity system come up short? Nurs Manage. Jun 1999;30(6):40A-40C. *Not eligible exposure.*
1583. LaDuke S. It can happen to you: the firsthand accounts of six nurses accused of and disciplined for professional misconduct. J Emerg Nurs. Aug 2001;27(4):369-376. *Legal cases.*
1584. Lageson C. Quality focus of the first line nurse manager and relationship to unit outcomes. J Nurs Care Qual. Oct-Dec 2004;19(4):336-342. *Not eligible exposure.*
1585. Laitinen P, Isola A. Promoting participation of informal caregivers in the hospital care of the elderly patient: informal caregivers' perceptions. J Adv Nurs. May 1996;23(5):942-947. *Not eligible target population.*
1586. Lalani NS, Gulzar AZ. Nurses' role in patients' discharge planning at the Aga Khan University Hospital, Pakistan. J Nurses Staff Dev. Nov-Dec 2001;17(6):314-319. *Not eligible target population.*
1587. Lamb J, Ross S. Pain management. A patient's perspective. Can Nurse. Aug 1999;95(7):30-33. *Comment.*
1588. Lamb LS, Jr., Parrish RS, Goran SF, Biel MH. Current nursing practice of point-of-care laboratory diagnostic testing in critical care units. Am J Crit Care. Nov 1995;4(6):429-434. *Not eligible exposure.*
1589. Lambert C. In the red. Nurs Times. Oct 27-Nov 2 1999;95(43):16-17. *Comment*.
1590. Lambing AY, Adams DL, Fox DH, Divine G. Nurse practitioners' and physicians' care activities and clinical outcomes with an inpatient geriatric population. J Am Acad Nurse Pract. Aug 2004;16(8):343-352. *Not eligible exposure.*
1591. Lamkin L, Rosiak J, Buerhaus P, Mallory G, Williams M. Oncology Nursing Society Workforce Survey. Part II: perceptions of the nursing workforce environment and adequacy of nurse staffing in outpatient and inpatient oncology settings. Oncol Nurs Forum. Jan-Feb 2002;29(1):93-100. *Not eligible outcomes.*
1592. Lampat L, Frederick B, Young D, Dankbar G. Changing the start of the hospital workweek. Nurs Econ. Jul-Aug 1991;9(4):263-265. *Not eligible exposure.*
1593. Lancaster R. Lifting the lid. Nurs Stand. Aug 5-11 1998;12(46):20-22. *Comment*.
1594. Lancelot A, Sims J. Mental illness and substance abuse. Nurs Times. Sep 27-Oct 3 2001;97(39):36-37. *Case reports.*
1595. Landergan E. Staffing for census fluctuations. Nurs Manage. May 1997;28(5):77-78. *Comment.*

1596. Landreville P, Dicaire L, Verrault R, et al. A training program for managing agitation of residents in long-term care facilities: description and preliminary findings. Journal of gerontological nursing Mar 2005;31(3):34-42, 55-6. *Nursing home.*
1597. Lang TA, Hodge M, Olson V, Romano PS, Kravitz RL. Nurse-patient ratios: a systematic review on the effects of nurse staffing on patient, nurse employee, and hospital outcomes. J Nurs Adm. Jul-Aug 2004;34(7-8):326-337. *Review.*
1598. Langslow A. Nursing and the law. Vigilance in the OR. Aust Nurs J. Oct 1996;4(4):30-32. *Case Reports.*
1599. Lankshear AJ, Sheldon TA, Maynard A. Nurse staffing and healthcare outcomes: a systematic review of the international research evidence. ANS Adv Nurs Sci. Apr-Jun 2005;28(2):163-174. *Review.*
1600. Lanser EG. Leveraging your nursing resources. Healthc Exec. Jul-Aug 2001;16(4):50-51. *Comment.*
1601. Lanza ML, Kayne HL, Hicks C, Milner J. Nursing staff characteristics related to patient assault. Issues Ment Health Nurs. Jun-Sep 1991;12(3):253-265. *Not eligible outcomes.*
1602. Larcombe J. Bed-blockers. Mental block. Nurs Times. Jun 20-26 1990;86(25):33-34. *Case Reports.*
1603. Lark K, Dean K, Mikos CA. Nursing liability risk--three perspectives. Fla Nurse. Mar 2000;48(1):22-23. *Legal Cases.*
1604. Larkin GL, Rolniak S, Hyman KB, MacLeod BA, Savage R. Effect of an administrative intervention on rates of screening for domestic violence in an urban emergency department. Am J Public Health. Sep 2000;90(9):1444-1448. *Not eligible outcomes.*
1605. Larkin H. The case for nurse practitioners. Used correctly, they can improve outcomes, lower costs and make up for reduced residents' hours. Hosp Health Netw. Aug 2003;77(8):54-58, 52. *Not eligible exposure.*
1606. Larrabee JH. Achieving outcomes in a joint-appointment role. Outcomes Manag Nurs Pract. Apr-Jun 2001;5(2):52-56. *Comment.*
1607. Larrabee JH, Ostrow CL, Withrow ML, Janney MA, Hobbs GR, Jr., Burant C. Predictors of patient satisfaction with inpatient hospital nursing care. Res Nurs Health. Aug 2004;27(4):254-268. *Not eligible exposure.*
1608. Larson EL, Bryan JL, Adler LM, Blane C. A multifaceted approach to changing handwashing behavior. Am J Infect Control. Feb 1997;25(1):3-10. *Not eligible exposure.*
1609. Larson EL, Cimiotti J, Haas J, Parides M, Nesin M, Della-Latta P, Saiman L. Effect of antiseptic handwashing vs alcohol sanitizer on health care-associated infections in neonatal intensive care units. Arch Pediatr Adolesc Med. Apr 2005;159(4):377-383. *Not eligible exposure.*
1610. Larson L. Restoring the relationship: the key to nurse and patient satisfaction. Trustee. Oct 2004;57(9):8-10, 12-14, 11. *Comment.*
1611. Larsson G, Berg V. Linen in the hospital bed: effects on patients' well-being. J Adv Nurs. Aug 1991;16(8):1004-1008. *Not eligible target population.*
1612. Larter J. Three-part model manages care from admission through postdischarge. Disch Plann Update. Mar-Apr 1993;13(2):1, 20-23. *Not eligible outcomes.*
1613. Laschinger HK, Almost J, Tuer-Hodes D. Workplace empowerment and magnet hospital characteristics: making the link. J Nurs Adm. Jul-Aug 2003;33(7-8):410-422. Not eligible exposure.
1614. Laschinger HK, Finegan J, Shamian J, Casier S. Organizational trust and empowerment in restructured healthcare settings. Effects on staff nurse commitment. J Nurs Adm. Sep 2000;30(9):413-425. *Not eligible exposure.*
1615. Laschinger HK, Finegan J, Shamian J, Wilk P. Impact of structural and psychological empowerment on job strain in nursing work settings: expanding Kanter's model. J Nurs Adm. May 2001;31(5):260-272. Not eligible exposure.
1616. Laschinger HK, Wong C, McMahon L, Kaufmann C. Leader behavior impact on staff nurse empowerment, job tension, and work effectiveness. J Nurs Adm. May 1999;29(5):28-39. *Not eligible exposure.*
1617. Laurent C. Ward managers. Too hot to handle? Health Serv J. Aug 23 2001;111(5769):22-25. *Not eligible target population.*
1618. Lauri S, Lepisto M, Kappeli S. Patients' needs in hospital: nurses' and patients' views. J Adv Nurs. Feb 1997;25(2):339-346. *Not eligible target population.*
1619. Lawler K. How audit can improve provision of in-patient pain services. Prof Nurse. Sep 2001;17(1):41. *Comment.*
1620. Lawson K. Trading places--a seasonal exchange program. Rn. Oct 1990;53(10):19-21. *No association tested.*
1621. Lawson S, Aston S, Baker L, Fegan CD, Milligan DW. Trained nurses can obtain satisfactory bone marrow aspirates and trephine biopsies. J Clin Pathol. Feb 1999;52(2):154-156. *Not eligible target population.*
1622. Lawton LC, Rose P. Changing practice in invasive procedures: the experience of the Krishnan Chandran children's centre. J Child Health Care. Dec 2003;7(4):248-257. *Not eligible target population.*
1623. Layon AJ, George BE, Hamby B, Gallagher TJ. Do elderly patients overutilize healthcare resources and benefit less from them than younger patients? A study of patients who underwent craniotomy for treatment of neoplasm. Crit Care Med. May 1995;23(5):829-834. *Not eligible exposure.*
1624. Lazure LL. Strategies to increase patient control of visiting. Dimens Crit Care Nurs. Jan-Feb 1997;16(1):11-19. *Not eligible exposure.*
1625. Le Blanc PM, de Jonge J, de Rijk AE, Schaufeli WB. Well-being of intensive care nurses (WEBIC): a job analytic approach. J Adv Nurs. Nov 2001;36(3):460-470. *Not eligible target population.*
1626. Lea A, Bloodworth C. Modernising the 12-hour shift. Nurs Stand. Jan 22-28 2003;17(19):33-36. *Not eligible target population.*
1627. Leach E. Have qualifications, will travel. Nurs Times. Apr 13-19 2000;96(15):55-57. *Comment.*

1628. Leary TS, Milner QJ, Niblett DJ. The accuracy of the estimation of body weight and height in the intensive care unit. Eur J Anaesthesiol. Nov 2000;17(11):698-703. *Not eligible target population.*
1629. L'Ecuyer PB, Schwab EO, Iademarco E, Barr N, Aton EA, Fraser VJ. Randomized prospective study of the impact of three needleless intravenous systems on needlestick injury rates. Infect Control Hosp Epidemiol. Dec 1996;17(12):803-808. *Not eligible exposure.*
1630. Lee CS, Shiu AT. Perceived health care climate, diabetes knowledge and self-care practice of Hong Kong Chinese older patients: a pilot study. J Clin Nurs. May 2004;13(4):534-535. *Not eligible target population.*
1631. Lee D. Overtime--mandatory or voluntary? Br J Perioper Nurs. Feb 2002;12(2):63. *Not eligible target population.*
1632. Lee DS. The morning tea break ritual: a case study. Int J Nurs Pract. Apr 2001;7(2):69-73. *Not eligible target population.*
1633. Lee EH. Breast self-examination performance among Korean nurses. J Nurses Staff Dev. Mar-Apr 2003;19(2):81-87. *Not eligible target population.*
1634. Lee EO, Ahn SH, You C, Lee DS, Han W, Choe KJ, Noh DY. Determining the main risk factors and high-risk groups of breast cancer using a predictive model for breast cancer risk assessment in South Korea. Cancer Nurs. Sep-Oct 2004;27(5):400-406. *Not eligible target population.*
1635. Lee F. Violence in A&E: the role of training and self-efficacy. Nurs Stand. Aug 1-7 2001;15(46):33-38. *Not eligible target population.*
1636. Lee G. The needs of the service. Pract Midwife. Feb 2000;3(2):44. *Comment.*
1637. Lee H, Hwang S, Kim J, Daly B. Predictors of life satisfaction of Korean nurses. J Adv Nurs. Dec 2004;48(6):632-641. *Not eligible target population.*
1638. Lee H, Song R, Cho YS, Lee GZ, Daly B. A comprehensive model for predicting burnout in Korean nurses. J Adv Nurs. Dec 2003;44(5):534-545. *Not eligible target population.*
1639. Lee JM, Botteman MF, Nicklasson L, Cobden D, Pashos CL. Needlestick injury in acute care nurses caring for patients with diabetes mellitus: a retrospective study. Curr Med Res Opin. May 2005;21(5):741-747. *Not eligible exposure*
1640. Lee KA, Lipscomb J. Clinical update. Sleep among shiftworkers -- a priority for clinical practice and research in occupational health nursing. AAOHN Journal Oct 2003;51(10):418-20. *Not relevant.*
1641. Lee KA. Self-reported sleep disturbances in employed women. Sleep. Dec 1992;15(6):493-498. *Not eligible outcomes.*
1642. Lee KA, Rittenhouse CA. Prevalence of perimenstrual symptoms in employed women. Women Health. 1991;17(3):17-32. *Not eligible outcomes.*
1643. Lee KA, Rittenhouse CA. Health and perimenstrual symptoms: health outcomes for employed women who experience perimenstrual symptoms. Women Health. 1992;19(1):65-78. *Not eligible exposure.*
1644. Lee L, Goor E, Kennedy C, Walters S, Kirby L. Non-acute casemix in the Illawarra. J Qual Clin Pract. Mar 1994;14(1):23-30. *Not eligible target population.*
1645. Lee RJ, Mills MEE. Management issues. International nursing recruitment experience. Journal of Nursing Administration Nov 2005;35(11):478-81. *Not research.*
1646. Lee S. Relocating elderly people and nursing staff from the NHS to the independent sector. J Adv Nurs. Oct 1998;28(4):859-864. *Not eligible target population.*
1647. Lee S, Crockett MS. Effect of assertiveness training on levels of stress and assertiveness experienced by nurses in Taiwan, Republic of China. Issues Ment Health Nurs. Jul-Aug 1994;15(4):419-432. *Not eligible target population.*
1648. Lee TH, Cook EF, Fendrick AM, Shammash JB, Wolfe EP, Weisberg MC, Goldman L. Impact of initial triage decisions on nursing intensity for patients with acute chest pain. Med Care. Aug 1990;28(8):737-745. *Not eligible exposure.*
1649. Lee TT. Nurses' concerns about using information systems: analysis of comments on a computerized nursing care plan system in Taiwan. J Clin Nurs. Mar 2005;14(3):344-353. *Not eligible target population.*
1650. Lee TT, Chang PC. Standardized care plans: experiences of nurses in Taiwan. J Clin Nurs. Jan 2004;13(1):33-40. *Not eligible target population.*
1651. Lee YL, Cesario T, Tran C, Stone G, Thrupp L. Nasal colonization by methicillin-resistant coagulase-negative staphylococcus in community skilled nursing facility patients. Am J Infect Control. Jun 2000;28(3):269-272. *Not eligible target population.*
1652. Lees L, Holmes C. Estimating date of discharge at ward level: a pilot study. Nurs Stand. Jan 5-11 2005;19(17):40-43. *Not eligible target population.*
1653. Leftridge DW, Lydford CW. Decentralizing an overtime budget. Nurs Manage. Aug 1993;24(8):52-53. *No association tested.*
1654. Leggett J, Silvester J. Care staff attributions for violent incidents involving male and female patients: a field study. Br J Clin Psychol. Nov 2003;42(Pt 4):393-406. *Not eligible target population.*
1655. Leicht KT, Fennell ML, Witkowski KM. The effects of hospital characteristics and radical organizational change on the relative standing of health care professions. J Health Soc Behav. Jun 1995;36(2):151-167. *Not eligible outcomes.*
1656. Leifer D. Anything but magnolia. Nurs Stand. Apr 3-9 2002;16(29):16-17. *Not eligible target population.*
1657. Leifer D. A rotation programme that works. Nurs Stand. Mar 19-25 2003;17(27):16. *Comment.*
1658. Leininger SM. Tools for building a successful orthopaedic pathway. Orthop Nurs. Mar-Apr 1996;15(2):11-19. *Not eligible exposure.*
1659. Leino-Kilpi H, Valimaki M, Dassen T, Gasull M, Lemonidou C, Scott PA, Arndt M, Kaljonen A. Maintaining privacy on post-natal wards: a study in five European countries. J Adv Nurs. Jan 2002;37(2):145-154. *Not eligible target population.*

1660. Leinonen T, Leino-Kilpi H, Stahlberg MR, Lertola K. Comparing patient and nurse perceptions of perioperative care quality. Appl Nurs Res. Feb 2003;16(1):29-37. *Not eligible target population.*
1661. Lemmen SW, Zolldann D, Gastmeier P, Lutticken R. Implementing and evaluating a rotating surveillance system and infection control guidelines in 4 intensive care units. Am J Infect Control. Apr 2001;29(2):89-93. *Not eligible target population.*
1662. Lemonidou C, Plati C, Brokalaki H, Mantas J, Lanara V. Allocation of nursing time. Scand J Caring Sci. 1996;10(3):131-136. *Not eligible target population.*
1663. Lenehan GP. ED short staffing: It is time to take a hard look at a growing problem and strategies such as standard nurse-patient ratios. J Emerg Nurs. Apr 1999;25(2):77-78. *Editorial.*
1664. Lenehan GP. On mandatory overtime and wearing blue ribbons. J Emerg Nurs. Jun 2000;26(3):201-202. *Editorial.*
1665. Lengacher CA, Kent K, Mabe PR, Heinemann D, VanCott ML, Bowling CD. Effects of the partners in care practice model on nursing outcomes. Nurs Econ. Nov-Dec 1994;12(6):300-308. *Not eligible exposure.*
1666. Lengacher CA, Mabe PR, Heinemann D, VanCott ML, Kent K, Swymer S. Collaboration in research: testing the PIPC model on clinical and nonclinical outcomes. Nursingconnections. Spring 1997;10(1):17-30. *Not eligible exposure.*
1667. Lepola I, Blom-Lange M. Participation in change: self-reflection of staff in a psychiatric admission unit. Nurs Health Sci. Sep 1999;1(3):171-177. *Not eligible target population.*
1668. Leslie GD. Know your staff numbers--and know you're right. Aust Crit Care. Aug 2003;16(3):83. *Editorial.*
1669. Letvak SA. Should a staff nurse's age be a consideration in making patient and shift assignments? Pro. MCN Am J Matern Child Nurs. Mar-Apr 2005;30(2):84. *Comment.*
1670. Leveck ML, Jones CB. The nursing practice environment, staff retention, and quality of care. Res Nurs Health. Aug 1996;19(4):331-343. *Not eligible outcomes.*
1671. Levenstam AK, Engberg IB. The Zebra system--a new patient classification system. J Nurs Manag. Sep 1993;1(5):229-237. *Not eligible target population.*
1672. Levenstam AK, Engberg IB. How to translate nursing care into costs and staffing requirements: part two in the Zebra system. J Nurs Manag. Mar 1997;5(2):105-114. *Not eligible target population.*
1673. Levy CR, Ely EW, Payne K, Engelberg RA, Patrick DL, Curtis JR. Quality of dying and death in two medical ICUs: perceptions of family and clinicians. Chest. May 2005;127(5):1775-1783. *Not eligible exposure.*
1674. Lewandrowski K, Cheek R, Nathan DM, Godine JE, Hurxthal K, Eschenbach K, Laposata M. Implementation of capillary blood glucose monitoring in a teaching hospital and determination of program requirements to maintain quality testing. Am J Med. Oct 1992;93(4):419-426. *Not eligible exposure.*
1675. Lewis EN. An in-house registry: a pragmatic approach that works! Nurs Manage. Feb 1991;22(2):43-44, 48. *No association tested.*
1676. Lewis JA, Della PR. Alternative nurse rostering: an evaluation. Aust Health Rev. 1994;17(2):29-39. *Not eligible target population.*
1677. Lewis KK. Nurse-to-patient ratios: research and reality. Issue Brief (Mass Health Policy Forum). Mar 30 2005(25):1-19. *Review.*
1678. Lewis L. Discussion & recommendations: safe medication administration: an invitational symposium recommends ways of addressing obstacles. J Infus Nurs. Mar-Apr 2005;28(2 Suppl):42-44, 46-47. *Review.*
1679. Lewis T, Abanobi B, Alleman P, et al. The Methodist Hospital CCU: a Beacon unit of excellence. Crit Care Nurs Clin North Am. Jun 2005;17(2):149-154, x. *Review.*
1680. Lewis T, Oliver G. Improving tracheostomy care for ward patients. Nurs Stand. Jan 19-25 2005;19(19):33-37. *Not eligible exposure.*
1681. Libby DL, Bolduc PC. Float pool orientation. J Nurs Staff Dev. Nov-Dec 1995;11(6):297-299. *No association tested.*
1682. Lichtenstein B, Brumfield C, Cliver S, Chapman V, Lenze D, Davis V. Giving birth, going home: influences on when low-income women leave hospital. Health (London). Jan 2004;8(1):81-100. *Not eligible exposure.*
1683. Lilienberg A, Bengtsson M, Starkhammar H. Implantable devices for venous access: nurses' and patients' evaluation of three different port systems. J Adv Nurs. Jan 1994;19(1):21-28. *Not eligible target population.*
1684. Lilley LL, Guanci R. Applying systems theory. Am J Nurs. Nov 1995;95(11):14-15. *Comment.*
1685. Lilley LL, Guanci R. Sound-alike cephalosporins. How drugs with similar spellings and sounds can lead to serious errors. Am J Nurs. Jun 1995;95(6):14. *Comment.*
1686. Lilley LL, Guanci R. Med errors: watch those labels. Am J Nurs. May 1996;96(5):14. *Case Reports.*
1687. Lilley LL, Guanci R. Avoiding heparin dosing mistakes. Am J Nurs. Dec 1997;97(12):12. *Comment.*
1688. Lilley LL, Guanci R. Look-alike abbreviations: prescriptions for confusion. Am J Nurs. Nov 1997;97(11):12. *Case Reports.*
1689. Lilley LL, Guanci R. Careful with the zeros! How to minimize one of the most persistent causes of gross medication errors. Am J Nurs. May 1997;97(5):14. *Comment.*
1690. Lilley LL, Guanci R. Neuromuscular blocking agents. Am J Nurs. Feb 1997;97(2):12-14. *Comment.*
1691. Lilley LL, Guanci R. Distraction delays a dose. Am J Nurs. Feb 1998;98(2):12. *Case Reports.*
1692. Lin MC, Chen CH. An investigation on the nursing competence of southern Taiwan nurses who have passed N3 case report accreditation. J Nurs Res. Sep 2004;12(3):203-212. *Not eligible target population.*

1693. Lincoln LL, Dudley MN. Potential effect of oral antimicrobial therapy on nurse staffing requirements. Am J Hosp Pharm. Feb 1990;47(2):386-388. *No association tested.*
1694. Lindley-Jones M, Finlayson BJ. Triage nurse requested x rays--are they worthwhile? J Accid Emerg Med. Mar 2000;17(2):103-107. *Not eligible target population.*
1695. Lindsay M. Is the postanesthesia care unit becoming an intensive care unit? J Perianesth Nurs. Apr 1999;14(2):73-77. *Comment.*
1696. Lindsey T, Watts-Tate N, Southwood E, Routhieaux J, Beatty J, Diane C, Phillips M, Lea G, Brown E, DeBaun MR. Chronic blood transfusion therapy practices to treat strokes in children with sickle cell disease. J Am Acad Nurse Pract. Jul 2005;17(7):277-282. *Not eligible exposure.*
1697. Lininger RA. Pediatric peripheral i.v. insertion success rates. Pediatr Nurs. Sep-Oct 2003;29(5):351-354. *Not eligible outcomes.*
1698. Lipley N. Millennium bed bug. Nurs Stand. Nov 3-9 1999;14(7):12. *Not eligible target population.*
1699. Lipley N. Pressure gauge. Nurs Stand. Feb 9-15 2000;14(21):12-13. *Comment.*
1700. Lipley N. Breaking the cycle of bad news. Nurs Stand. Oct 10-16 2001;16(4):13. *Comment.*
1701. Little K, Palmer D. Central line exit sites: which dressing? Nurs Stand. Aug 19-25 1998;12(48):42-44. *Not eligible exposure.*
1702. Little M. When do you 'say no' to work assignments? Tenn Nurse. Jun 1991;54(3):17-19. *Comment.*
1703. Litvak E, Buerhaus PI, Davidoff F, et al. Managing unnecessary variability in patient demand to reduce nursing stress and improve patient safety. Jt Comm J Qual Patient Saf. Jun 2005;31(6):330-338. *Review.*
1704. Liu JJ. Assessing the relationship between staffing levels and quality outcomes in nursing facilities. Dissertation. 2003;DAI-A 64/06, p. 2211, Dec 2003:AAT 3092765. *Not eligible Target population.*
1705. Livesley J. Telling tales: a qualitative exploration of how children's nurses interpret work with unaccompanied hospitalized children. J Clin Nurs. Jan 2005;14(1):43-50. *Not eligible exposure.*
1706. Livingston C. Chicago jobfocus. A forceful health care community. Am J Nurs. Mar 1991;91(3):89-90, 92, 94-85. *News.*
1707. Livne M, Steinmann M. Pressure ulcer prevention project: an international outcomes report from Israel. Outcomes Manag. Jul-Sep 2002;6(3):99-102. *Not eligible target population.*
1708. Lloyd G, McLauchlan A. Nurses' attitudes towards management of pain. Nurs Times. Oct 26-Nov 1 1994;90(43):40-43. *Not eligible exposure*.
1709. Lloyd R, Goulding J. Nursing rotas. Shift up. Health Serv J. Oct 14 1999;109(5676):28. *Not eligible target population.*
1710. Locsin RC. Caring and curing orientations of foreign-educated professional nurses. Philippine Journal of Nursing Jan-Jun 1997;67(1-2):27-32. *Not relevant.*
1711. Lomas C. Make the most of flexible working. Nurs Times. May 3-9 2005;101(18):76-77. *Comment.*
1712. Long CG, Blackwell CC, Midgley M. An evaluation of two systems of in-patient care in a general hospital psychiatric unit. II: Measures of staff and patient performance. J Adv Nurs. Dec 1990;15(12):1436-1442. *Not eligible target population.*
1713. Long CG, Blackwell CC, Midgley M. An evaluation of two systems of in-patient care in a general hospital psychiatric unit I: staff and patient perceptions and attitudes. J Adv Nurs. Jan 1992;17(1):64-71. *Not eligible target population.*
1714. Long G. Measuring the benefits of bedside documentation systems. Aspens Advis Nurse Exec. Dec 1994;10(3):1-4. *Not eligible exposure.*
1715. Long T. Pointing out medication errors. Am J Nurs. Feb 1992;92(2):76-78. *Comment.*
1716. Lookinland S, Crenshaw J. Rewarding clinical competence in the ICU: using outcomes to reward performance. Dimens Crit Care Nurs. Jul-Aug 1996;15(4):206-215. *Comment.*
1717. Lough-Miramontes A. Stop announcing JCAHO inspections. Nursing. Sep 2002;32(9):12. *Letter.*
1718. Lovern E. Study: RNs can bolster outcomes. Mod Healthc. Apr 30 2001;31(18):4-5. *News.*
1719. Lovett RB, McMillan SC. Validity and reliability of a bone marrow transplant acuity tool. Oncol Nurs Forum. Oct 1993;20(9):1385-1392. *Not eligible target population.*
1720. Lovett RB, Wagner L, McMillan S. Validity and reliability of a pediatric hematology oncology patient acuity tool. J Pediatr Oncol Nurs. Jul 1991;8(3):122-130. *Not eligible outcomes.*
1721. Lu WH, Kolkman K, Seger M, Sugrue M. An evaluation of trauma team response in a major trauma hospital in 100 patients with predominantly minor injuries. Aust N Z J Surg. May 2000;70(5):329-332. *Not eligible target population.*
1722. Ludkin H, Quinn P, Jones SE, Wilkinson K. The benefits of setting up a nurse hysteroscopy service. Prof Nurse. Dec 2003;19(4):220-222. *Not eligible target population.*
1723. Ludwig-Beymer P, Czurylo KT, Gattuso MC, Hennessy KA, Ryan CJ. The effect of testing on the reported incidence of medication errors in a medical center. J Contin Educ Nurs. Jan-Feb 1990;21(1):11-17. *Not eligible exposure.*
1724. Lukacs A. Issues surrounding early postpartum discharge: effects on the caregiver. J Perinat Neonatal Nurs. Jun 1991;5(1):33-42. *Not eligible exposure.*
1725. Lukman D, May JH, Shuman LJ, Wolfe HB. Knowledge-based schedule formulation and maintenance under uncertainty. J Soc Health Syst. 1991;2(2):42-64. *No association tested.*
1726. Lumsdon K. Crash course: piecing together the continuum of care. Hosp Health Netw. Nov 20 1994;68(22):26-28, 30, 32 passim. *Comment.*
1727. Lund CH, Osborne JW. Validity and reliability of the neonatal skin condition score. J Obstet Gynecol Neonatal Nurs. May-Jun 2004;33(3):320-327. *Not eligible exposure.*

1728. Lund CH, Osborne JW, Kuller J, Lane AT, Lott JW, Raines DA. Neonatal skin care: clinical outcomes of the AWHONN/NANN evidence-based clinical practice guideline. Association of Women's Health, Obstetric and Neonatal Nurses and the National Association of Neonatal Nurses. J Obstet Gynecol Neonatal Nurs. Jan-Feb 2001;30(1):41-51. *Not eligible exposure.*
1729. Lundgren A, Wahren LK. Effect of education on evidence-based care and handling of peripheral intravenous lines. J Clin Nurs. Sep 1999;8(5):577-585. *Not eligible target population.*
1730. Lundgren S, Segesten K. Nurses' use of time in a medical-surgical ward with all-RN staffing. J Nurs Manag. Jan 2001;9(1):13-20. *Not eligible target population.*
1731. Lundgren SM, Nordholm L, Segesten K. Job satisfaction in relation to change to all-RN staffing. J Nurs Manag. Jul 2005;13(4):322-328. *Not eligible target population.*
1732. Lundgren SM, Segesten K. Nurses' altered conceptions of work in a ward with all-RN staffing. J Clin Nurs. Mar 2002;11(2):197-204. *Not eligible target population.*
1733. Lunetta C. Employing foreign nurses. Trustee. Apr 1991;44(4):3. *News.*
1734. Lunney M, Karlik BA, Kiss M, Murphy P. Accuracy of nurses' diagnoses of psychosocial responses. Nurs Diagn. Oct-Dec 1997;8(4):157-166. *Not eligible exposure.*
1735. Lupfer PA, Altieri M, Sheridan MJ, Lilly CC. Patient flow in the emergency department: the chest pain patient. Am J Emerg Med. Mar 1991;9(2):127-130. *Not eligible exposure.*
1736. Lupton D, Fenwick J. 'They've forgotten that I'm the mum': constructing and practising motherhood in special care nurseries. Soc Sci Med. Oct 2001;53(8):1011-1021. *Not eligible target population.*
1737. Lush MT, Henry SB. Nurses use of health status data to plan for patient care: implications for the development of a computer-based outcomes infrastructure. Proc AMIA Annu Fall Symp. 1997:136-140. *Not eligible exposure.*
1738. Luther KM, Maguire L, Mazabob J, Sexton JB, Helmreich RL, Thomas E. Engaging nurses in patient safety. Crit Care Nurs Clin North Am. Dec 2002;14(4):341-346. *Not eligible exposure.*
1739. Luther KM, Walsh K. Moving out of the red zone: addressing staff allocation to improve patient satisfaction. Jt Comm J Qual Improv. Jul 1999;25(7):363-368. *Not eligible exposure.*
1740. Lynn MR, Kelley B. Effects of case management on the nursing context--perceived quality of care, work satisfaction, and control over practice. Image J Nurs Sch. 1997;29(3):237-241. *Not eligible exposure.*
1741. Lynn MR, McMillen BJ. Do nurses know what patients think is important in nursing care? J Nurs Care Qual. Jun 1999;13(5):65-74. *Not eligible exposure.*
1742. Lyon J. Power napping and work performance. Nev Rnformation. Nov 1995;4(4):18. *Comment.*
1743. Lyon JC, Gerbis PR. Acuity vs staffing mix. Nev Rnformation. Nov 1994;3(4):1, 3. *Comment.*
1744. Ma CC, Samuels ME, Alexander JW. Factors that influence nurses' job satisfaction. J Nurs Adm. May 2003;33(5):293-299. *Not eligible exposure.*
1745. MacDonald M, Bodzak W. The performance of a self-managing day surgery nurse team. J Adv Nurs. Apr 1999;29(4):859-868. *Not eligible target population.*
1746. MacDonald MR, Miller-Grolla L. Developing a collective future: creating a culture specific nurse caring practice model for hospitals. Can J Nurs Adm. Sep-Oct 1995;8(3):78-95. *No association tested.*
1747. Mackay I, Paterson B, Cassells C. Constant or special observations of inpatients presenting a risk of aggression or violence: nurses' perceptions of the rules of engagement. J Psychiatr Ment Health Nurs. Aug 2005;12(4):464-471. *Not eligible target population.*
1748. MacKenzie J, Jordan K. Discharge planning. Oiling the wheels. Health Serv J. Oct 23 1997;107(5576):32-33. *Not eligible target population.*
1749. Mackie PL, Joannidis PA, Beattie J. Evaluation of an acute point-of-care system screening for respiratory syncytial virus infection. J Hosp Infect. May 2001;48(1):66-71. *Not eligible target population.*
1750. Mackintosh C. Do nurses provide adequate postoperative pain relief? Br J Nurs. Apr 14-27 1994;3(7):342-347. *Not eligible target population.*
1751. Macleod AJ, Freeland P. Should nurses be allowed to request X-rays in an accident & emergency department? Arch Emerg Med. Mar 1992;9(1):19-22. *Not eligible target population.*
1752. MacPhee M. Hospital networking. Comparing the work of nurses with flexible and traditional schedules. J Nurs Adm. Apr 2000;30(4):190-198. *Not eligible outcomes.*
1753. Macready N. Trial of Denver nurses points up system flaws. OR Manager. Mar 1999;15(3):32-33. *Comment.*
1754. MacStravic S. Employee success management: a cure for the staffing crisis? Health Care Strateg Manage. Aug 2002;20(8):1, 15-19. *Comment.*
1755. MacVicar J, Dobbie G, Owen-Johnstone L, Jagger C, Hopkins M, Kennedy J. Simulated home delivery in hospital: a randomised controlled trial. Br J Obstet Gynaecol. Apr 1993;100(4):316-323. *Not eligible target population.*
1756. MacWhannell D. Take the medical model out of the menopause. Nurs Times. Oct 13-19 1999;95(41):45-46. *Not eligible target population.*
1757. Mahon A. HSJ people. Ifs and cuts. Health Serv J. Dec 11 2003;113(5885):36-37. *Not eligible target population.*
1758. Mahoney. The extent, nature, and response to victimization of emergency nurses in Pennsylvania... including commentary by Lanza ML with author response. Journal of Emergency Nursing Oct 1991;17(5):282-94. *Not relevant.*
1759. Mahony C. Watchdog's verdict: millions squandered, nurses neglected. Nurs Times. Sep 6-12 2001;97(36):10-11. *Not eligible target population.*

1760. Mahrenholz DM. Colleagues in caring. Connecticut Nursing News Jun-Aug 1999;72(2):22-3. *Not peer reviewed.*
1761. Main J. Management of relatives of patients who are dying. J Clin Nurs. Nov 2002;11(6):794-801. *Not eligible target population.*
1762. Makinen A, Kivimaki M, Elovainio M, Virtanen M, Bond S. Organization of nursing care as a determinant of job satisfaction among hospital nurses. J Nurs Manag. Sep 2003;11(5):299-306. *Not eligible target population.*
1763. Makowiec-Dabrowska T, Krawczyk-Adamus P, Sprusinska E, Jozwiak ZW. Can nurses be employed in 12-hour shift systems? Int J Occup Saf Ergon. 2000;6(3):393-403. *Not eligible target population.*
1764. Malcolmson L, Lavender T, Walkinshaw S. Visiting on the maternity wards. Pract Midwife. Mar 1999;2(3):20-23. *Not eligible target population.*
1765. Malik U. Clients' health needs: nurses' concern. Nurs J India. Feb 1996;87(2):29-32. *Not eligible target population.*
1766. Mallison MB. Let's identify the Yellowhearts in our midst. Am J Nurs. Feb 1991;91(2):7. *Editorial.*
1767. Mallison MB. Cadillac or Chevrolet nursing? Look under the hood. Am J Nurs. Jan 1992;92(1):7. *Editorial.*
1768. Malloch K, Conovaloff A. Patient classification systems, Part 1: The third generation. J Nurs Adm. Jul-Aug 1999;29(7-8):49-56. *No association tested.*
1769. Malloch K, Neeld AP, McMurry C, Meeks L, Wallach M, Williams S, Conovaloff A. Patient classification systems, Part 2: The third generation. J Nurs Adm. Sep 1999;29(9):33-42. *Not eligible outcomes.*
1770. Malone JA. Milieu and part-time nurses: a contradiction? J Psychosoc Nurs Ment Health Serv. Jul 1994;32(7):7. *Editorial.*
1771. Malone RE. Night shifts and breast cancer risk: policy implications. J Emerg Nurs. Apr 2002;28(2):169-171. *Review.*
1772. Mamaril M. The official ASPAN position: ICU overflow patients in the PACU. J Perianesth Nurs. Aug 2001;16(4):274-277. *Comment.*
1773. Mancher T. A better model by design ... and it works! Nurs Manage. May 2001;32(5):45-47. *Comment.*
1774. Manchester A. New care model threatens patient safety. Nurs N Z. Oct 1997;3(9):26-27. *News.*
1775. Manheim LM, Feinglass J, Shortell SM, Hughes EF. Regional variation in Medicare hospital mortality. Inquiry. Spring 1992;29(1):55-66. *Not eligible exposure.*
1776. Manias E, Aitken R, Dunning T. Medication management by graduate nurses: before, during and following medication administration. Nurs Health Sci. Jun 2004;6(2):83-91. *Not eligible target population.*
1777. Manias E, Aitken R, Peerson A, Parker J, Wong K. Agency nursing work in acute care settings: perceptions of hospital nursing managers and agency nurse providers. J Clin Nurs. Jul 2003;12(4):457-466. *Not eligible target population.*
1778. Manias E, Aitken R, Peerson A, Parker J, Wong K. Agency-nursing work: perceptions and experiences of agency nurses. Int J Nurs Stud. Mar 2003;40(3):269-279. *Not eligible target population.*
1779. Manne SL, Jacobsen PB, Redd WH. Assessment of acute pediatric pain: do child self-report, parent ratings, and nurse ratings measure the same phenomenon? Pain. Jan 1992;48(1):45-52. *Not eligible exposure.*
1780. Manning ML, Archibald LK, Bell LM, Banerjee SN, Jarvis WR. Serratia marcescens transmission in a pediatric intensive care unit: a multifactorial occurrence. Am J Infect Control. Apr 2001;29(2):115-119. *Not eligible exposure.*
1781. Manojlovich M, Spence Laschinger HK. The relationship of empowerment and selected personality characteristics to nursing job satisfaction. J Nurs Adm. Nov 2002;32(11):586-595. *Not eligible exposure.*
1782. Mansheim P. Short-term psychiatric inpatient treatment of preschool children. Hosp Community Psychiatry. Jun 1990;41(6):670-672. *Not eligible exposure.*
1783. Mansley A. Caring for rape survivors. Nurs Times. Apr 29-May 5 1998;94(17):24-26. *Case Reports.*
1784. Mansson ME, Dykes AK. Practices for preparing children for clinical examinations and procedures in Swedish pediatric wards. Pediatr Nurs. May-Jun 2004;30(3):182-187, 229. *Not eligible target population.*
1785. Manthey M. Staffing and productivity. Nurs Manage. Dec 1991;22(12):20-21. *Comment.*
1786. Manthey M. A core incremental staffing plan. J Nurs Adm. Sep 2001;31(9):424-425. *Comment.*
1787. Maras V. Implementing cluster staffing. One manager's experience. Aorn J. Apr 1992;55(4):1074-1077, 1080. *Comment.*
1788. Marasovic C, Kenney C, Elliott D, Sindhusake D. Attitudes of Australian nurses toward the implementation of a clinical information system. Comput Nurs. Mar-Apr 1997;15(2):91-98. *Not eligible target population.*
1789. Marchewka AE. The demand for hospital nursing personnel. DAI-A 55/07, p. 2087, Jan 1995. 1993:AAT 9432310. *Not eligible outcomes.*
347. Marcus N. Night duty: sleeping sickness. Nurs Stand. Feb 22-28 1995;9(22):56. *Comment.*
348. Marden W. One bright initiative. Mater Manag Health Care. Jul 2002;11(7):20-22, 24. *Comment.*
349. Mark BA. Characteristics of nursing practice models. J Nurs Adm. Nov 1992;22(11):57-63. *Not eligible outcomes.*
1790. Mark BA, Salyer J, Harless DW. What explains nurses' perceptions of staffing adequacy? J Nurs Adm. May 2002;32(5):234-242. *Not eligible exposure.*
1791. Mark BA, Salyer J, Wan TT. Market, hospital, and nursing unit characteristics as predictors of nursing unit skill mix: a contextual analysis. J Nurs Adm. Nov 2000;30(11):552-560. *Not eligible outcomes.*

1792. Markey DW. Applying the synergy model: clinical strategies. Crit Care Nurse. Jun 2001;21(3):72-76. *Comment.*
1793. Markwick A. Defining what nursing is. Nurs Times. Mar 11-17 1998;94(10):21. *Case Reports.*
1794. Maroun VM. A look at licensure of foreign-educated nurses. Issues 1991;12(2):7. *Not relevant.*
1796. Marra C, Nimmo CR, Jewesson P. A prospective survey of knowledge and perceptions of ondansetron: what do health care workers know about this drug? Can J Hosp Pharm. Dec 1995;48(6):336-342. *Not eligible exposure.*
1797. Marson R, Taylor DM, Ashby K, Cassell E. Victorian Emergency Minimum Dataset: factors that impact upon the data quality. Emerg Med Australas. Apr 2005;17(2):104-112. *Not eligible exposure.*
1798. Martin B, Mathisen L. Use of physical restraints in adult critical care: a bicultural study. Am J Crit Care. Mar 2005;14(2):133-142. *Not eligible exposure.*
1799. Martin BJ. A successful approach to absenteeism. Nurs Manage. Aug 1990;21(8):45-48. *Not eligible exposure.*
1800. Martin PA, Gustin TJ, Uddin DE, Risner P. Organizational dimensions of hospital nursing practice: longitudinal results. J Nurs Adm. Dec 2004;34(12):554-561. *No association tested.*
1801. Martin SD. Striking nurses win from coast to coast. Am Nurse. Mar-Apr 2002;34(2):8. *Comment.*
1802. Martinello RA, Jones L, Topal JE. Correlation between healthcare workers' knowledge of influenza vaccine and vaccine receipt. Infect Control Hosp Epidemiol. Nov 2003;24(11):845-847. *Not eligible exposure.*
1803. Martorella C. Implementing a patient classification system. Nurs Manage. Dec 1996;27(12):29-31. *No association tested.*
1804. Mason DJ. Nursing science: who cares? Am J Nurs. Dec 1999;99(12):7. *Editorial.*
1805. Mason DJ. How many patients are too many? Am J Nurs. Nov 2003;103(11):7. *Editorial.*
1806. Mason DJ. That's nursing! No, that's appalling. Am J Nurs. Jul 2004;104(7):11. *Editorial.*
1807. Mason DJ, Kany KA. The state of the science: focus on work environments. Am J Nurs. Mar 2005;105(3):33-34. *Comment.*
1808. Masta O. Night cover. Nurs Stand. Aug 20-26 2003;17(49):16-18. *Comment.*
1809. Mateo MA, Smith SP. Workforce diversity in hospitals. Nurs Leadersh Forum. Summer 2003;7(4):143-149. *Not eligible outcomes.*
1810. Mathew LJ, Gutsch HM, Hackney NW, Munsat EM. Promoting quality and cost-effective care to geropsychiatric patients. Issues Ment Health Nurs. Mar-Apr 1994;15(2):169-185. *Not eligible exposure.*
1811. Mathias JM. Sharing OR staff can help meet unpredictable staffing demands. OR Manager. May 2005;21(5):1, 12, 14. *Comment.*
1812. Mathias Judith M, Patterson P. Leaders find ways to tackle staff shortage. OR Manager. Sep 2002;18(9):20-22, 26. *Comment.*
1813. Mathur K, Bhattacharya SK, Kashyap SK. Behavioral effects and body activity level in female hospital staff nurses during work hour. J Hum Ergol (Tokyo). Jun 1995;24(1):1-11. *Not eligible target population.*
1814. Mattera MD. Outside the box. Rn. Apr 1997;60(4):7. *Editorial.*
1815. Mattera MD. Strike? Rn. Nov 1999;62(11):7. *Editorial.*
1816. Mattera MD. Guts. Rn. Mar 2000;63(3):7. *Editorial.*
1817. Matthiesen V, Lamb KV, McCann J, Hollinger-Smith L, Walton JC. Hospital nurses' views about physical restraint use with older patients. J Gerontol Nurs. Jun 1996;22(6):8-16. *Not eligible exposure.*
1818. Maul I, Laubli T, Klipstein A, Krueger H. Course of low back pain among nurses: a longitudinal study across eight years. Occup Environ Med. Jul 2003;60(7):497-503. *Not eligible exposure.*
1819. Maunder RG, Lancee WJ, Rourke S, Hunter JJ, Goldbloom D, Balderson K, Petryshen P, Steinberg R, Wasylenki D, Koh D, Fones CS. Factors associated with the psychological impact of severe acute respiratory syndrome on nurses and other hospital workers in Toronto. Psychosom Med. Nov-Dec 2004;66(6):938-942. *Not eligible exposure.*
1820. Maurier WL, Northcott HC. Job uncertainty and health status for nurses during restructuring of health care in Alberta. West J Nurs Res. Aug 2000;22(5):623-641. *Not eligible outcomes.*
1821. Maxam-Moore VA, Wilkie DJ, Woods SL. Analgesics for cardiac surgery patients in critical care: describing current practice. Am J Crit Care. Jan 1994;3(1):31-39. *Not eligible exposure.*
1822. Maxwell M. Are you an HR star? Test your knowledge. Nurs Econ. Jul-Aug 2004;22(4):214-215. *Comment.*
1823. May DD, Grubbs LM. The extent, nature, and precipitating factors of nurse assault among three groups of registered nurses in a regional medical center. J Emerg Nurs. Feb 2002;28(1):11-17. *Not eligible exposure.*
1824. May J, Ellis-Hill C, Payne S. Gatekeeping and legitimization: how informal carers' relationship with health care workers is revealed in their everyday interactions. J Adv Nurs. Nov 2001;36(3):364-375. *Not eligible target population.*
1825. Mayer C, Andrusyszyn MA, Iwasiw C. Codman Award Paper: self-efficacy of staff nurses for health promotion counselling of patients at risk for stroke. Axone. Jun 2005;26(4):14-21. *Not eligible exposure.*
1826 Mayer GG, Buckley RF, White TL. Direct nursing care given to patients in a subacute rehabilitation center. Rehabilitation Nursing Mar-Apr 1990;15(2):86-8. *Not relevant.*
1827. Mayer T, Cates R, Flinn R. Fee-for-service nursing: an idea ready to be tested. ED Manag. Dec 1998;10(12):142-144. *Comment.*
1828. Mayer TA, Cates RJ, Mastorovich MJ, Royalty DL. Emergency department patient satisfaction: customer service training improves patient satisfaction and ratings of physician and nurse skill. J Healthc Manag. Sep-Oct 1998;43(5):427-440; discussion 441-422. *Not eligible exposure.*

1829. Mayer TA, Zimmermann PG. ED customer satisfaction survival skills: one hospital's experience. J Emerg Nurs. Jun 1999;25(3):187-191. *Not eligible exposure.*
1830. Mayne JE. Teaching path balances LOS, education needs for MI. Hosp Case Manag. Nov 1995;3(11):171-174. *Not eligible exposure.*
1831. Mayo AM, Duncan D. Nurse perceptions of medication errors: what we need to know for patient safety. J Nurs Care Qual. Jul-Sep 2004;19(3):209-217. *Not eligible exposure.*
1832. McAlpine LC, Cargill G. Effects of summer employment on student nurses: implications for recruitment and retention of staff nurses. Canadian journal of nursing administration Sep-Oct 1992;5(3):23-7. *Not relevant.*
1833. McBride L, Walden-McBride D. Balancing the 'heart' of patient care. Home Healthc Nurse. Jul-Aug 1995;13(4):46-49. *Not eligible target population.*
1834. McCabe C. Nurse-patient communication: an exploration of patients' experiences. J Clin Nurs. Jan 2004;13(1):41-49. *Not eligible exposure.*
1835. McCann E, Bowers L. Training in cognitive behavioural interventions on acute psychiatric inpatient wards. J Psychiatr Ment Health Nurs. Apr 2005;12(2):215-222. *Not eligible target population.*
1836. McCann TV. Willingness to provide care and treatment for patients with HIV/AIDS. J Adv Nurs. May 1997;25(5):1033-1039. *Not eligible target population.*
1837. McCartney PR. Centering pregnancy: a renaissance in prenatal care? MCN Am J Matern Child Nurs. Jul-Aug 2004;29(4):261. *Comment.*
1838. McCarty MC, Zander KM, Hennrikus DJ, Lando HA. Barriers among nurses to providing smoking cessation advice to hospitalized smokers. Am J Health Promot. Nov-Dec 2001;16(2):85-87, ii. *Not eligible exposure.*
1839. McCloskey JM. Nurse staffing and patient outcomes. Nurs Outlook. Sep-Oct 1998;46(5):199-200. *Review.*
1840. McConnell EA. American registered nurse medical device education: a comparison of simple and complex devices. Biomed Instrum Technol. Nov-Dec 1995;29(6):520-526. *Not eligible exposure.*
1841. McConnell EA. How and what staff nurses learn about the medical devices they use in direct patient care. Res Nurs Health. Apr 1995;18(2):165-172. *Not eligible exposure.*
1842. McConnell EA. Patients, machines, and staff nurses. Nursingconnections. Summer 1997;10(2):5-11. *Not eligible exposure.*
1843. McConnell EA, Cattonar M, Manning J. Australian registered nurse medical device education: a comparison of simple vs. complex devices. J Adv Nurs. Feb 1996;23(2):322-328. *Not eligible target population.*
1844. McConnell EA, Fletcher J, Nissen JH. A comparison of Australian and American registered nurses' use of life-sustaining medical devices in critical care and high-dependency units. Heart Lung. Sep-Oct 1993;22(5):421-427. *Not eligible target population.*
1845. McConnell EA, Fletcher J, Nissen JH. Medical device education among Australian registered nurses. A comparison of agency and hospital nurses. Int J Technol Assess Health Care. Summer 1995;11(3):585-594. *Not eligible target population.*
1846. McCormack B. A case study identifying nursing staffs' perception of the delivery method of nursing care in practice on a particular ward. J Adv Nurs. Feb 1992;17(2):187-197. *Not eligible target population.*
1847. McCormack PJ, Cooper R, Sutherland S, Stewart H. The safe use of syringe drivers for palliative care: an action research project. Int J Palliat Nurs. Dec 2001;7(12):574-580. *Not eligible target population.*
1848. McCoy AK. Developing self-scheduling in critical care. Dimens Crit Care Nurs. May-Jun 1992;11(3):152-156. *No association tested.*
1849. McCrea J. Four honoured for rescue role. N Z Nurs J. Jun 1992;85(5):9, 34. *News.*
1850. McCrea MA, Atkinson M, Bloom T, Merkh K, Najera IL, Smith C. The healing energy of relationships. A journey to excellence. Nurs Adm Q. Jul-Sep 2003;27(3):240-248. *Comment.*
1851. McCue M, Mark BA, Harless DW. Nurse staffing, quality, and financial performance. J Health Care Finance. Summer 2003;29(4):54-76. *Not eligible outcomes.*
1852. McDaniel AM, Kristeller JL, Hudson DM. Chart reminders increase referrals for inpatient smoking cessation intervention. Nicotine Tob Res. Jun 1999;1(2):175-180. *Not eligible exposure*.
1853. McDaniel C. Organizational culture and ethics work satisfaction. J Nurs Adm. Nov 1995;25(11):15-21. *Not eligible exposure.*
1854. McDonald DD. Gender and ethnic stereotyping and narcotic analgesic administration. Res Nurs Health. Feb 1994;17(1):45-49. *Not eligible exposure.*
1855. McDonald J. Justifying our practice. Can Nurse. Oct 1998;94(9):47-48. *Comment.*
1856. McDonald S. An ethical dilemma: risk versus responsibility. J Psychosoc Nurs Ment Health Serv. Jan 1994;32(1):19-25. *No association tested.*
1857. McElligott D, Holz MB, Carollo L, Somerville S, Baggett M, Kuzniewski S, Shi Q. A pilot feasibility study of the effects of touch therapy on nurses. J N Y State Nurses Assoc. Spring-Summer 2003;34(1):16-24. *Not eligible exposure.*
1858. McEndree B. Shoes. Okla Nurse. Oct-Dec 1996;41(4):13. *Comment.*
1859. McGavock MB. Third Annual Nursing Administration Recognition Program. Third Place...Flextra and incentive compensation. J Nurs Adm. Apr 1991;21(4):16. *Comment.*
1860. McGillis Hall L, Doran D, Baker GR, Pink GH, Sidani S, O'Brien-Pallas L, Donner GJ. Nurse staffing models as predictors of patient outcomes. Med Care. Sep 2003;41(9):1096-1109. *Not eligible association presentation.*
1861. McGillis Hall L, Doran D, Pink GH. Nurse staffing models, nursing hours, and patient safety outcomes. J Nurs Adm. Jan 2004;34(1):41-45. *Not eligible association presentation.*

1862. McGloin S, Knowles J. An evaluation of the critical care assistant role within an acute NHS Trust Critical Care Unit. Nurs Crit Care. Jul-Aug 2005;10(4):210-215. *Not eligible exposure.*
1863. McGregor LA. Short, shorter, shortest: continuing to improve the hospital stay for mothers and newborns. MCN Am J Matern Child Nurs. Jul-Aug 1996;21(4):191-196. *Comment.*
1864. McGuire LC, Bell AZ. Developing an enhanced minor injury unit for support of urban festivities. Eur J Emerg Med. Sep 2001;8(3):193-197. *Not eligible exposure.*
1865. McGuire T. Shiftwork. How to cope with life in the shadows. Alta RN. Oct 2001;57(5):9. *Comment.*
1866. McHugh ML. Cost-effectiveness of clustered unit vs. unclustered nurse floating. Nursing Economics Nov-Dec 1997;15(6):294-300. *Not relevant.*
1867. McKay S, Smith SY. "What are they talking about? Is something wrong?" Information sharing during the second stage of labor. Birth. Sep 1993;20(3):142-147. *Not eligible exposure.*
1868. McKenna H, Hasson F. A study of skill mix issues in midwifery: a multimethod approach. J Adv Nurs. Jan 2002;37(1):52-61. *Not eligible target population.*
1869. McKenna HP. Nursing skill mix substitutions and quality of care: an exploration of assumptions from the research literature. J Adv Nurs. Mar 1995;21(3):452-459. *Not eligible target population.*
1870. McKiel E. Impact of organizational restructuring on nurses' facilitation of parental participatory care. Can J Nurs Leadersh. Jan-Feb 2002;15(1):14-17. *Comment.*
1871. McKillop A. Casual nurses meet a demand. Nurs N Z. Nov 1995;1(10):20-21. *Not eligible target population.*
1872. McKinley A. Health care providers and facilities issue brief: health facilities: year end report-2004. Issue Brief Health Policy Track Serv. Dec 31 2004:1-12. *Not eligible target population.*
1873. McKnight JD, Glass DC. Perceptions of control, burnout, and depressive symptomatology: a replication and extension. J Consult Clin Psychol. Jun 1995;63(3):490-494. *Comment.*
1874. McLain SR. Hospital workforce shortages--a glimpse at the reasons and possible solutions. Okla Nurse. Jun-Aug 2003;48(2):14-16. *Comment.*
1875. McLaren BJ. Limitations on employment protection provided by the Americans with Disabilities Act (ADA). Colo Nurse. Dec 1998;98(4):20-21. *Legal Cases.*
1876. McLaughlin FE, Barter M, Thomas SA, Rix G, Coulter M, Chadderton H. Perceptions of registered nurses working with assistive personnel in the United Kingdom and the United States. Int J Nurs Pract. Feb 2000;6(1):46-57. *Not eligible target population.*
1877. McLennan CA. Workload measurement tool for an integrated OR/PACU. Can Oper Room Nurs J. Mar-Apr 1994;12(1):28-31. *Comment.*
1878. McLeod A. Support role spreads the workload in intensive care. Nurs Times. Jul 19-25 2001;97(29):40-41. *Comment.*
1879. McMillan SC, Tittle M, Hagan S, et al. Knowledge and attitudes of nurses in veterans hospitals about pain management in patients with cancer. Oncology nursing forum Oct 2000;27(9):1415-23. *Not relevant.*
1880. McMullin JP, Cook DJ, Meade MO, Weaver BR, Letelier LM, Kahmamoui K, Higgins DA, Guyatt GH. Clinical estimation of trunk position among mechanically ventilated patients. Intensive Care Med. Mar 2002;28(3):304-309. *Not eligible exposure.*
1881. McNeal LJ. Should a staff nurse's age be a consideration in making patient and shift assignments? Con. MCN Am J Matern Child Nurs. Mar-Apr 2005;30(2):85. *Comment.*
1882. McNees P, Dow KH, Loerzel VW. Application of the CuSum technique to evaluate changes in recruitment strategies. Nursing research Nov-Dec 2005;54(6):399-405. *Not relevant.*
1883. McSharry M. Quality of life: but in whose judgement? Edtna Erca J. Jul-Sep 1996;22(3):15-18. *Not eligible target population.*
1884. McVay K. Bottom line concerns eroding quality health care. Revolution. Winter 1997;7(4):11. *Comment.*
1885. McWilliam CL, Stewart M, Vingilis E, Hoch J, Ward-Griffin C, Donner A, Browne G, Coyte P, Anderson K. Flexible client-driven in-home case management: an option to consider. Care Manag J. Summer 2004;5(2):73-86. *Not eligible target population.*
1886. Medland JJ, Marcon J, Curia M. Sabbatical leave: a creative retention strategy. Crit Care Nurse. Dec 1994;14(6):63-67. *Not eligible exposure.*
1887. Mee CL, Cirone NR, Levinger CV. MERG: medication event rating grid. Nurs Manage. Apr 1996;27(4):34, 36, 38. *Comment.*
1888. Meehan AJ, Carey N, Haynes DE. A clinical pathway for the secondary diagnosis of alcohol misuse: implications for the orthopaedic patient. Orthop Nurs. Nov-Dec 1998;17(6):49-54, 64. *Not eligible exposure.*
1889. Meehan TC. Careful nursing: a model for contemporary nursing practice. J Adv Nurs. Oct 2003;44(1):99-107. *Not eligible target population.*
1890. Mehn J, Haas D. What to tell families about drug errors. Hosp Health Netw. Feb 1999;73(2):30. *News.*
1891. Meikle K. The role of health care assistants in hospitals. Nurs N Z. Feb 2002;8(1):18-19. *Not eligible target population.*
1892. Melchior ME, Philipsen H, Abu-Saad HH, Halfens RJ, van de Berg AA, Gassman P. The effectiveness of primary nursing on burnout among psychiatric nurses in long-stay settings. J Adv Nurs. Oct 1996;24(4):694-702. *Not eligible target population.*
1893. Melchior ME, van den Berg AA, Halfens R, Huyer Abu-Saad H, Philipsen H, Gassman P. Burnout and the work environment of nurses in psychiatric long-stay care settings. Soc Psychiatry Psychiatr Epidemiol. Apr 1997;32(3):158-164. *Not eligible target population.*
1894. Melifonwu R. Ward leaders. Miracle worker. Interview by Jenine Willis. Nurs Times. Jun 23-29 1999;95(25):30-31. *Interview.*

1895. Meltzer LS, Huckabay LM. Critical care nurses' perceptions of futile care and its effect on burnout. Am J Crit Care. May 2004;13(3):202-208. *Not eligible exposure.*
1896. Melville E. Flexible working: banking your assets. Nurs Stand. Apr 20-26 1994;8(30):90-91. *Not eligible target population.*
1897. Menzel NN, Brooks SM, Bernard TE, Nelson A. The physical workload of nursing personnel: association with musculoskeletal discomfort. Int J Nurs Stud. Nov 2004;41(8):859-867. *Not eligible Exposure.*
1898. Merkouris A, Papathanassoglou ED, Lemonidou C. Evaluation of patient satisfaction with nursing care: quantitative or qualitative approach? Int J Nurs Stud. May 2004;41(4):355-367. *Not eligible target population.*
1899. Merkouris A, Papathanassoglou ED, Pistolas D, Papagiannaki V, Floros J, Lemonidou C. Staffing and organisation of nursing care in cardiac intensive care units in Greece. Eur J Cardiovasc Nurs. Jul 2003;2(2):123-129. *Not eligible target population.*
1900. Merrion P, Ngeo C. Nursing relief. In answer to hospital shortages, bill would allow some foreign nurses to work in U.S. Mod Healthc. Nov 10 1997;27(45):56. *News.*
1901. Metcalf KM. The helper model: nine ways to make it work. Nurs Manage. Dec 1992;23(12):40-43. *Comment.*
1902. Meurier CE, Vincent CA, Parmar DG. Learning from errors in nursing practice. J Adv Nurs. Jul 1997;26(1):111-119. *Not eligible target population.*
1903. Meyer MS, Siegel M. How much is enough? Agency nurse orientation. J Nurs Staff Dev. Jan-Feb 1996;12(1):41-42. *Comment.*
1904. Meyers S. Real men choose nursing. Nursing schools and hospitals target men in their recruitment efforts. Trustee. May 2003;56(5):18-21, 11. *News.*
1905. Michael JE. Is it patient abandonment--or not? Rn. Aug 2002;65(8):67-70. *Comment.*
1906. Michie S, Ridout K, Johnston M. Stress in nursing and patients' satisfaction with health care. Br J Nurs. Sep 12-25 1996;5(16):1002-1006. *Not eligible target population.*
1907. Middleton S, Lumby J. Comparing professional and patient outcomes for the same episode of care. Aust J Adv Nurs. Sep-Nov 1999;17(1):22-27. *Not eligible target population.*
1908. Milette IH, Carnevale FA. I'm trying to heal...noise levels in a pediatric intensive care unit. Dynamics. Winter 2003;14(4):14-21. *Not eligible exposure.*
1909. Millar B. Behind every great nurse. Nurs Times. Mar 22-28 2001;97(12):24-26. *Not eligible target population.*
1910. Miller BK, Haber J, Byrne MW. The experience of caring in the acute care setting: patient and nurse perspectives. NLN Publ. Apr 1992(15-2465):137-156. *No association tested.*
1911. Miller D. Comparisons of pain ratings from postoperative children, their mothers, and their nurses. Pediatr Nurs. Mar-Apr 1996;22(2):145-149. *Not eligible exposure.*
1912. Miller DL. Post procedural interventional cardiology patients on the progressive care unit. Prog Cardiovasc Nurs. Winter 1999;14(1):14-17, 36. *Not eligible exposure.*
1913. Miller E. Record snowstorm transforms hospitals to RN "dorms". Nurs Spectr (Wash D C). Jan 16 1996;6(2):4. *Comment.*
1914. Miller K. The road taken. Revolution. Oct-Nov 2003;4(5):18-23. *Comment.*
1915. Miller KH, Grindel CG, Patsdaughter CA. Risk classification, clinical outcomes, and the use of nursing resources for cardiac surgery patients. Dimens Crit Care Nurs. Mar-Apr 1999;18(2):44-49. *Not eligible exposure.*
1916. Miller KH, Grindel CG, Patsdaughter CA. Cardiac surgery's calculated risk. Nurs Manage. Jul 1999;30(7):34-36, 38-40. *No association tested.*
1917. Miller SF, Finley RK, Waltman M, Lincks J. Burn size estimate reliability: a study. J Burn Care Rehabil. Nov-Dec 1991;12(6):546-559. *Not eligible exposure.*
1918. Mills-Senn P. Staffing. Avoiding culture clash. As the number of foreign-born nurses climbs, executives look for ways to bridge cultural gap. Hosp Health Netw. Apr 2005;79(4):30, 32. *News.*
1919. Milstead JA. Leapfrog Group: a prince in disguise or just another frog? Nurs Adm Q. Summer 2002;26(4):16-25. *Review.*
1920. Minichiello TM, Auerbach AD, Wachter RM. Caregiver perceptions of the reasons for delayed hospital discharge. Eff Clin Pract. Nov-Dec 2001;4(6):250-255. *Not eligible exposure.*
1921. Minnick A, Leahey M, Pischke-Winn K. The impact of patient point-of-view pharmacy delivery on labor and quality. Nurs Econ. Jan-Feb 1994;12(1):45-50. *Not eligible exposure.*
1922. Minnick A, Leipzig RM. The restraint match-up. Three lessons show how nurse leaders can influence the use of physical restraints. Nurs Manage. Mar 2001;32(3):37-39. *Comment.*
1923. Minton JA, Creason NS. Evaluation of admission nursing diagnoses. Nurs Diagn. Jul-Sep 1991;2(3):119-125. *Not eligible outcomes.*
1924. Miracle K. Restraints: friend or foe? Ky Hosp Mag. Winter 1991;8(1):10-11. *Comment.*
1925. Mistiaen P, van Harteveld J. A comment on the Duke University Center Health Profile. Med Care. Jun 1992;30(6):471-472 *.Editorial.*
1926. Mitchell A, Van Berkel C, Adam V, Ciliska D, Sheppard K, Baumann A, Underwood J, Walter S, Gafni A, Edwards N, et al. Comparison of liaison and staff nurses in discharge referrals of postpartum patients for public health nursing follow-up. Nurs Res. Jul-Aug 1993;42(4):245-249. *Not eligible exposure.*
1927. Mitchell D, Grindel CG, Laurenzano C. Sexual abuse assessment on admission by nursing staff in general hospital psychiatric settings. Psychiatr Serv. Feb 1996;47(2):159-164. *Not eligible exposure.*
1928. Mitchell GJ, Closson T, Coulis N, Flint F, Gray B. Patient-focused care and human becoming thought: connecting the right stuff. Nurs Sci Q. Jul 2000;13(3):216-224. *Case Reports.*

1929. Mitchell PH, Lang NM. Nurse staffing: a structural proxy for hospital quality? Med Care. Jan 2004;42(1):1-3. *Comment.*
1930. Moait S. 10 hr night duty win. Lamp. May 1996;53(4):10-12. *Comment.*
1931. Mobberley T. NT/3M National Nursing Awards. Family favourite. Nurs Times. Dec 29-2000 Jan 5 1999;95(50):34-35. *Comment.*
1932. Moens G, Mylle G, Johannik K, Van Hoof R, Helsen G. Analysing and interpreting routinely collected data on sharps injuries in assessing preventative actions. Occup Med (Lond). Jun 2004;54(4):245-249. *Not eligible target population.*
1933. Molloy P. Promoting night shift. Nurs N Z. Aug 1995;1(7):13-15. *Not eligible target population.*
1934. Molzahn AE, Northcott HC, Dossetor JB. Quality of life of individuals with end stage renal disease: perceptions of patients, nurses, and physicians. Anna J. Jun 1997;24(3):325-333; discussion 334-325. *Not eligible exposure.*
1935. Monet SS. Nurses indicted ... a wave of the future? Hawaii Nurse (Honol). Jul-Aug 1997;4(4):1, 5. *Legal Cases.*
1936. Mongeau C. Voices from Colorado. Nursing. Jun 1998;28(6):48-49. *Case Reports.*
1937 Moody L, Snyder PE. Hospital provider satisfaction with a new documentation system. Nursing Economics Jan-Feb 1995;13(1):24-31. *Not relevant.*
1938. Moody LE, Slocumb E, Berg B, Jackson D. Electronic health records documentation in nursing: nurses' perceptions, attitudes, and preferences. Comput Inform Nurs. Nov-Dec 2004;22(6):337-344. *Not eligible exposure.*
1939. Moolenaar RL, Crutcher JM, San Joaquin VH, Sewell LV, Hutwagner LC, Carson LA, Robison DA, Smithee LM, Jarvis WR. A prolonged outbreak of Pseudomonas aeruginosa in a neonatal intensive care unit: did staff fingernails play a role in disease transmission? Infect Control Hosp Epidemiol. Feb 2000;21(2):80-85. *Not eligible exposure.*
1940. Moons M, Kerkstra A, Biewenga T. Specialized home care for patients with AIDS: an experiment in Rotterdam, The Netherlands. J Adv Nurs. Jun 1994;19(6):1132-1140. *Not eligible target population*.
1941. Moore K, Lynn MR, McMillen BJ, Evans S. Implementation of the ANA report card. J Nurs Adm. Jun 1999;29(6):48-54. *Not eligible association presentation.*
1942. Moore MM, Nguyen D, Nolan SP, Robinson SP, Ryals B, Imbrie JZ, Spotnitz W. Interventions to reduce decibel levels on patient care units. Am Surg. Sep 1998;64(9):894-899. *Not eligible exposure*.
1943. Moran J. Finally, the 38-hour week. Qld Nurse. Nov-Dec 1994;13(6):6-8. *Comment.*
1944. Morath J, Fleischmann R, Boggs G. A missing consideration: the psychiatric patient classification for scheduling-staffing systems. Perspect Psychiatr Care. 1990;25(3-4):40-47. *Not eligible exposure.*
1945. Moreno R, Reis Miranda D. Nursing staff in intensive care in Europe: the mismatch between planning and practice. Chest. Mar 1998;113(3):752-758. *Not eligible target population.*
1946. Morgan SP, DeRose C. Reduce workload intensity with PCTs. Nurs Manage. Nov 2003;34(11):9. *Not eligible exposure.*
1947. Morita T, Miyashita M, Kimura R, Adachi I, Shima Y. Emotional burden of nurses in palliative sedation therapy. Palliat Med. Sep 2004;18(6):550-557. *Not eligible target population.*
1948. Morita T, Shima Y, Miyashita M, Kimura R, Adachi I. Physician- and nurse-reported effects of intravenous hydration therapy on symptoms of terminally ill patients with cancer. J Palliat Med. Oct 2004;7(5):683-693. *Not eligible target population.*
1949. Morley B. Reclaiming the night. Nurs Times. Jun 29-Jul 5 1994;90(26):54-55. *Comment.*
1950. Morohashi Y. Questions concerning medical care provided in hospitals. Jpn Hosp. Jul 1992;11:1-9. *Not eligible target population.*
1951. Morrison AL, Beckmann U, Durie M, Carless R, Gillies DM. The effects of nursing staff inexperience (NSI) on the occurrence of adverse patient experiences in ICUs. Aust Crit Care. Aug 2001;14(3):116-121. *Not eligible target population.*
1952. Morrison M. The paradigm shift from traditional obstetrics to single room maternity care. Fla Nurse. Mar 1993;41(3):7. *Comment.*
1953. Morrison P. A multidimensional scalogram analysis of the use of seclusion in acute psychiatric settings. J Adv Nurs. Jan 1990;15(1):59-66. *Not eligible target population.*
1954. Morrison P, Lehane M. The effect of staffing levels on the use of seclusion. J Psychiatr Ment Health Nurs. 1995;2(6):365-366. *Comment.*
1955. Morrison P, Lehane M. A study of the official records of seclusion. Int J Nurs Stud. Apr 1996;33(2):223-235. *Not eligible target population.*
1956. Morrison P, Phillips C, Burnard P. Staff and patient satisfaction in a forensic unit. J Psychiatr Ment Health Nurs. 1996;3(1):67-69. *Comment.*
1957. Morrison WE, Haas EC, Shaffner DH, Garrett ES, Fackler JC. Noise, stress, and annoyance in a pediatric intensive care unit. Crit Care Med. Jan 2003;31(1):113-119. *Not eligible exposure.*
1958. Morrissey J. Quality vs. quantity. IOM report: hospitals must cut back workload and hours of nurses to maintain patient safety. Mod Healthc. Nov 10 2003;33(45):8, 11. *News.*
1959. Morrow KL. Using staffing and scheduling information to support change. Nurs Manage. May 1994;25(5):78-80. *Comment.*
1960. Morton HR, Himes JK, Stevens B. The Foreign Nurse Program: an innovative NCLEX review. J Contin Educ Nurs. Mar-Apr 1992;23(2):81-82. *Comment.*
1961. Moskowitz DB. Marketplace. Why hospitals' staffing woes today are unlike previous nurse shortages. Med Health. Oct 30 2000;54(42):suppl 1-2. *Comment.*
1962. Moss J, Xiao Y. Improving operating room coordination: communication pattern assessment. J Nurs Adm. Feb 2004;34(2):93-100. *Not eligible exposure.*

1963. Mrayyan MT. Perceptions of jordanian head nurses of variables that influence the quality of nursing care. J Nurs Care Qual. Jul-Sep 2004;19(3):276-279. *Not eligible target population.*
1964. Mudge B, Helferty M, Wallace L, Ouwendyk M. Nocturnal hemodialysis (NHD) adapted to the in-centre setting--a pilot study. J Cannt. Winter 1998;8(1):30-31. *Not eligible target population.*
1965. Muller K, Schwesig R, Leuchte S, Riede D. [Coordinative treatment and quality of life - a randomised trial of nurses with back pain]. Gesundheitswesen. Oct 2001;63(10):609-618. *Not eligible target population.*
1966. Murphy CL, McLaws ML. Who coordinates infection control programs in Australia? Am J Infect Control. Jun 1999;27(3):291-295. *Not eligible target population.*
1967. Murphy F. Stress among nephrology nurses in Northern Ireland. Nephrol Nurs J. Jul-Aug 2004;31(4):423-431. *Not eligible target population.*
1968. Murray MG, Snyder JC. When staff are assaulted. A nursing consultation support service. J Psychosoc Nurs Ment Health Serv. Jul 1991;29(7):24-29. *Not eligible outcomes.*
1969. Mustard LW. The culture of patient safety. JONAS Healthc Law Ethics Regul. Dec 2002;4(4):111-115. *Review.*
1970. Mustard LW. Improving patient satisfaction through the consistent use of scripting by the nursing staff. JONAS Healthc Law Ethics Regul. Sep 2003;5(3):68-72. *Not eligible exposure.*
1971. Myers H, Nikoletti S. Fall risk assessment: a prospective investigation of nurses' clinical judgement and risk assessment tools in predicting patient falls. Int J Nurs Pract. Jun 2003;9(3):158-165. *Not eligible target population.*
1972. Myers L. The NHS--a patient's perspective. Health Expect. Dec 2001;4(4):205-208. *Not eligible target population.*
1973. Myers M. Trauma coordinator: full-time or part-time? J Trauma Nurs. Jul-Sep 1998;5(3):59-61. *Editorial.*
1974. Myers SM. Patient-focused care: what managers should know. Nurs Econ. Jul-Aug 1998;16(4):180-188. *No association tested.*
1975. Myles GL, Perry AG, Malkoff MD, Shatto BJ, Scott-Killmade MC. Quantifying nursing care in barbiturate-induced coma with the therapeutic intervention scoring system. J Neurosci Nurs. Feb 1995;27(1):35-42. *Not eligible exposure.*
1976. Nader R. Arnold imitates art. Revolution. Mar-Apr 2005;6(2):7-8. *Review.*
1977. Nahalla CK, FitzGerald M. The impact of regular hospitalization of children living with thalassaemia on their parents in Sri Lanka: a phenomenological study. Int J Nurs Pract. Jun 2003;9(3):131-139. *Not eligible target population.*
1978. Naish J. Recruitment crisis returns. Nurs Manag (Harrow). Jan 1995;1(8):6-7. *Comment.*
1979. Naish J. Part-time working. Balancing act. Nurs Times. Feb 28-Mar 5 1996;92(9):28-30. *Not eligible target population.*
1980. Nakagawa J, Ouk S, Schwartz B, Schriger DL. Interobserver agreement in emergency department triage. Ann Emerg Med. Feb 2003;41(2):191-195. *Not eligible outcomes.*
1981 Napholz L. Sex role typology as a function of age among registered nurses. Health care for women international Jul-Sep 1992;13(3):303-12. *Not relevant.*
1982. Napthine R. Pen power--doctors under scrutiny. Aust Nurs J. Sep 1995;3(3):28-29. *Comment.*
1983. Nardini J. Medical errors--is the system "ill?" Nephrol Nurs J. Jun 2000;27(3):272-273. *Comment.*
1984. Nash MG, Blackwood D, Boone EB, 3rd, Klar R, Lewis E, MacInnis K, McKay J, Okress J, Richer S, Tannas C. Managing expectations between patient and nurse. J Nurs Adm. Nov 1994;24(11):49-55. *No association tested.*
1985. Nash MG, Miller G, Everett LN, Faber-Bermudez I, Libcke J, Nalon K. Third Annual Nursing Administration Recognition Program. Honorable Mention...Economic model for a hospital-based supplemental staffing program. J Nurs Adm. Apr 1991;21(4):17-18. *Comment.*
1986. Naumanen-Tuomela P. Finnish occupational health nurses' work and expertise: the clients' perspective. J Adv Nurs. May 2001;34(4):538-544. *Not eligible target population.*
1987. Nava S, Evangelisti I, Rampulla C, Compagnoni ML, Fracchia C, Rubini F. Human and financial costs of noninvasive mechanical ventilation in patients affected by COPD and acute respiratory failure. Chest. Jun 1997;111(6):1631-1638. *Not eligible target population.*
1988. Navarro VB, Stout WA, Jr., Tolley FM. Allocation of nursing care hours in a combined ophthalmic nursing unit. Insight. Apr 1995;20(1):14-16. *No association tested.*
1989. Nazarko L. Working parents: primary or secondary? Nurs Stand. Mar 11-17 1992;6(25):53-54. *Not eligible target population.*
1990. Nazarko L. Working parents: turning against rotation. Nurs Stand. Jun 10-16 1992;6(38):44. *Comment.*
1991. Nazarko L. Working mothers: short shrift for long. *Not eligible target population.*
1992. Needham I, Abderhalden C, Dassen T, Haug HJ, Fischer JE. The perception of aggression by nurses: psychometric scale testing and derivation of a short instrument. J Psychiatr Ment Health Nurs. Feb 2004;11(1):36-42. *Not eligible target population.*
1993. Needham I, Abderhalden C, Halfens RJ, Dassen T, Haug HJ, Fischer JE. The effect of a training course in aggression management on mental health nurses' perceptions of aggression: a cluster randomised controlled trial. Int J Nurs Stud. Aug 2005;42(6):649-655. *Not eligible exposure.*
1994. Neitzel JJ, Miller EH, Shepherd MF, Belgrade M. Improving pain management after total joint replacement surgery. Orthop Nurs. Jul-Aug 1999;18(4):37-45, 64. *Not eligible exposure.*
1995. Nelson J. Visit at your peril. Nurs Stand. Mar 13-19 1991;5(25):46. *Case Reports.*

1996. Nelson J. Shift patterns: a hard day's night. Nurs Stand. Jan 29-Feb 4 1992;6(19):54. *Comment.*
1997. Nelson MS. A triage-based emergency department patient classification system. J Emerg Nurs. Dec 1994;20(6):511-516. *Not eligible exposure.*
1998. Nelson NC, Evans RS, Samore MH, Gardner RM. Detection and prevention of medication errors using real-time bedside nurse charting. J Am Med Inform Assoc. Jul-Aug 2005;12(4):390-397. *Not eligible exposure.*
1999. Nelson S. Staffing, ratios and skill mix--is there an Australian story? Nurs Inq. Mar 2005;12(1):1. *Editorial.*
2000. Nerdahl P, Berglund D, Bearinger LH, et al. New challenges, new answers: pediatric nurse practitioners and the care of adolescents. Journal of Pediatric Health Care Jul-Aug 1999;13(4):183-90. *Not relevant.*
2001. Nesbitt-Johnson M. Burn unit ensures expert, specialized staffing. Nurs Manage. Sep 1998;29(9):40F. *Comment.*
2002. Neuhs HP. The nursing shortage: crisis as opportunity. J Nurs Adm. Mar 1991;21(3):5, 36. *Editorial.*
2003. Nevidjon B. Due to the nursing shortage, mandatory overtime is a necessary evil. Nurs Leadersh Forum. Winter 2001;6(2):32, 37-38. *Comment.*
2004. Newhouse RP, Johantgen M, Pronovost PJ, Johnson E. Perioperative nurses and patient outcomes--mortality, complications, and length of stay. Aorn J. Mar 2005;81(3):508-509, 513-522, 525-508. *Not eligible exposure.*
2005. Newman KM, Heine C. Availability of scheduling options important. J Nurs Adm. Jul-Aug 1991;21(7-8):46, 49. *Comment.*
2006. Ngin PM, Simms LM. Computer use for work accomplishment. A comparison between nurse managers and staff nurses. J Nurs Adm. Mar 1996;26(3):47-55. *Not eligible target population.*
2007. Nguyen BQ. You're not one of us. When discrimination based on national origin becomes a problem. Am J Nurs. Jan 2001;101(1):77. *Comment.*
2008. Nguyen GT, Proctor SE, SinkowitzCochran RL, et al. Status of infection surveillance and control programs in the United States, 1992-1996. American Journal of Infection Control Dec 2000;28(6):392-400. *Not relevant.*
2009. Nichol KL, Hauge M. Influenza vaccination of healthcare workers. Infect Control Hosp Epidemiol. Mar 1997;18(3):189-194. *Not eligible exposure.*
2010. Nicholls DJ, Duplaga EA, Meyer LM. Nurses' attitudes about floating. Nurs Manage. Jan 1996;27(1):56-58. *Comment.*
2011. Nicholson D, Ravenscroft E, Ray J, Stuart L. Staff mix and public safety. Nurs BC. Oct 2004;36(4):5. *Letter.*
2012. Nicklin W, Graves E. Nursing and patient outcomes: it's time for healthcare leadership to respond. Healthc Manage Forum. Spring 2005;18(1):9-13, 40-15. *Review.*
2013. Niederstadt JA. Frequency and timing of activated clotting time levels for sheath removal. J Nurs Care Qual. Jan-Mar 2004;19(1):34-38. *Not eligible target population.*
2014. Niedhammer I, Lert F, Marne MJ. Psychotropic drug use and shift work among French nurses (1980-1990). Psychol Med. Mar 1995;25(2):329-338. *Not eligible target population.*
2015. Noak J. Do we need another model for mental health care? Nurs Stand. Nov 7-13 2001;16(8):33-35. *Comment.*
2016. Norrie P. Nurses' time management in intensive care. Nurs Crit Care. May-Jun 1997;2(3):121-125. *Not eligible target population.*
2017. Northcott N, Facey S. Twelve-hour shifts: helpful or hazardous to patients? Nurs Times. Feb 15-22 1995;91(7):29-31. *Comment.*
2018. Norton A. Realistic rostering. Nurs N Z. Nov 1994;2(10):11. *Not eligible target population.*
2019. Norton A. Shifting the emphasis. Nurs N Z. Jun 1995;1(5):12. *Not eligible target population.*
2020. Noyes J. Are nurses respecting and upholding the human rights of children and young people in their care? Paediatr Nurs. Mar 2000;12(2):23-27. *Not eligible target population.*
2021. Nugent J. The NurseLink model of care. Contemp Nurse. Aug 2003;15(1-2):110-113. *Not eligible target population.*
2022. Nyqvist KH, Rubertsson C, Ewald U, Sjoden PO. Development of the Preterm Infant Breastfeeding Behavior Scale (PIBBS): a study of nurse-mother agreement. J Hum Lact. Sep 1996;12(3):207-219. *Not eligible target population.*
2023. Oates JD, Snowdon SL, Jayson DW. Failure of pain relief after surgery. Attitudes of ward staff and patients to postoperative analgesia. Anaesthesia. Sep 1994;49(9):755-758. *Not eligible exposure.*
2024. O'Brien JA. Utilization of nursing personnel from supplemental staffing agencies by health care facilities in Minnesota. Minnesota nursing accent Jan 1991;63(1):16-7. *Not peer reviewed.*
2025. O'Brien RL, Serbin MF, O'Brien KD, Maier RV, Grady MS. Improvement in the organ donation rate at a large urban trauma center. Arch Surg. Feb 1996;131(2):153-159. *Not eligible exposure.*
2026. O'Brien SP, Wind S, van Rijswijk L, Kerstein MD. Sequential biannual prevalence studies of pressure ulcers at Allegheny-Hahnemann University Hospital. Ostomy Wound Manage. Mar 1998;44(3A Suppl):78S-88S; discussion 89S. *Not eligible exposure.*
2027. O'Brien-Pallas L, Shamian J, Thomson D, Alksnis C, Koehoorn M, Kerr M, Bruce S. Work-related disability in Canadian nurses. J Nurs Scholarsh. 2004;36(4):352-357. *Not eligible outcomes.*
2028. O'Brodovich M, Rappaport P. A study pre and post unit dose conversion in a pediatric hospital. Can J Hosp Pharm. Feb 1991;44(1):5-15, 50. *Not eligible outcomes.*
2029. O'Connor R. Getting them over there. Nurs Stand. Mar 5-11 2003;17(25):16-17. *News.*

2030. O'Connor T. 12 hour shifts begin in Dunedin. N Z Nurs J. Nov 1992;85(10):20-21. *Not eligible target population.*
2031. O'Connor T. Statistics show sick system. Nurs N Z. Jul 1995;1(6):18-19. *Not eligible target population.*
2032. O'Connor T. Staffing levels cause concern. Nurs N Z. Nov 1999;5(10):11. *Comment.*
2033. O'Dowd A. Scotland. Soaring violence against nurses. Nurs Times. Jul 13-19 2000;96(28):5. *News.*
2034. O'Dowd A. Workplace violence. Call for police officer in every A&E. Nurs Times. Jul 20-26 2000;96(29):12-13. *News.*
2035. O'Dowd A. London trust in a royal mess. Nurs Times. Oct 19-25 2000;96(42):10-11. *News.*
2036. O'Dowd A. Are minimum staff ratios needed? Nurs Times. Apr 6-12 2004;100(14):12-13. *Not eligible target population.*
2037. O'Dowd A. Weighing up nurse-to-patient ratios. Nurs Times. Aug 2-8 2005;101(31):20-22. *Comment.*
2038. Oehler JM, Davidson MG. Job stress and burnout in acute and nonacute pediatric nurses. Am J Crit Care. Sep 1992;1(2):81-90. *Not eligible exposure.*
2039. Ofili AN, Asuzu MC, Okojie OH. Hospital workers' opinions on the predisposing factors to blood-related work accidents in Central Hospital, Benin City, Edo State, Nigeria. Public Health. Sep 2003;117(5):333-338. *Not eligible target population.*
2040. O'Hare MC, Bradley AM, Gallagher T, Shields MD. Errors in administration of intravenous drugs. Bmj. Jun 10 1995;310(6993):1536-1537. *Letter.*
2041. O'Hern-Martin P. Suburban hospital nurses fight for safe staffing. Revolution. Spring 1997;7(1):18-20. *Legal Cases.*
2042. Ohrn KE, Wahlin YB, Sjoden PO. Oral care in cancer nursing. Eur J Cancer Care (Engl). Mar 2000;9(1):22-29. *Not eligible target population.*
2043. Okolo SN, Ogbonna C. Knowledge, attitude and practice of health workers in Keffi local government hospitals regarding Baby-Friendly Hospital Initiative (BFHI) practices. Eur J Clin Nutr. May 2002;56(5):438-441. *Not eligible target population.*
2044. Oldenkamp JH, Heesen C, Simons JL. Application of telematics for improving multiple schedules. Stud Health Technol Inform. 1997;43 Pt A:64-68. *Not eligible target population.*
2045. O'Leary J, Williamson J. Meeting the challanges in today's outpatient oncology setting: a case study. J Oncol Manag. May-Jun 2003;12(3):24-26. *No association tested.*
2046. Oleni M, Johansson P, Fridlund B. Nursing care at night: an evaluation using the Night Nursing Care Instrument. J Adv Nurs. Jul 2004;47(1):25-32. *Not eligible target population.*
2047. Oleson M, Heading C, Shadick KM, Bistodeau JA. Quality of life in long-stay institutions in England: nurse and resident perceptions. J Adv Nurs. Jul 1994;20(1):23-32. *Not eligible target population.*
2048. Olive KE, Ballard JA. Attitudes of patients toward smoking by health professionals. Public Health Rep. May-Jun 1992;107(3):335-339. *Not eligible exposure.*
2049. Olson ME, Smith MJ. An evaluation of single-room maternity care. Health Care Superv. Sep 1992;11(1):43-49. *Not eligible exposure.*
2050. O'Neil E, Seago JA. Meeting the challenge of nursing and the nation's health. Jama. Oct 23-30 2002;288(16):2040-2041. *Comment.*
2051. O'Neill KL, Ross-Kerr JC. Impact of an instructional program on nurses' accuracy in capillary blood glucose monitoring. Clin Nurs Res. May 1999;8(2):166-178. *Not eligible exposure.*
2052. O'Neill TR, Tannenbaum RJ, Tiffen J. Recommending a minimum English proficiency standard for entry-level nursing. Journal of nursing measurement Fall 2005;13(2):129-46. *Not relevant.*
2053. O'Reilly M. Dying in an acute-care setting. Nurs N Z. Nov 2000;6(10):16-17. *Comment.*
2054. Ornstein H. The floating dilemma. Can Nurse. Oct 1992;88(9):20-22. *Comment.*
2055. Orsted HL, Campbell KE, Keast DH, Coutts P, Sterling W. Chronic wound caring ... a long journey toward healing. Ostomy Wound Manage. Oct 2001;47(10):26-36. *Case Reports.*
2056. Osborne J, Blais K, Hayes JS. Nurses' perceptions: when is it a medication error? J Nurs Adm. Apr 1999;29(4):33-38. *Not eligible exposure.*
2057. Osmon S, Harris CB, Dunagan WC, Prentice D, Fraser VJ, Kollef MH. Reporting of medical errors: an intensive care unit experience. Crit Care Med. Mar 2004;32(3):727-733. *Not eligible exposure.*
2058. Ostrowski M. Turn up the volume. Rn. Mar 2002;65(3):7. *Editorial.*
2059. Ostry AS, Tomlin KM, Cvitkovich Y, Ratner PA, Park IH, Tate RB, Yassi A. Choosing a model of care for patients in alternate level care: caregiver perspectives with respect to staff injury. Can J Nurs Res. Mar 2004;36(1):142-157. *Not eligible outcomes.*
2060. Ostry AS, Yassi A, Ratner PA, Park I, Tate R, Kidd C. Work organization and patient care staff injuries: the impact of different care models for "alternate level of care" patients. Am J Ind Med. Oct 2003;44(4):392-399. *Not eligible outcomes.*
2061. O'Sullivan J. Healthcare changes bring increased liability risk for nurses. Mo Nurse. Sep-Oct 1995;64(5):4. *Comment.*
2062. Overdyk FJ, Harvey SC, Fishman RL, Shippey F. Successful strategies for improving operating room efficiency at academic institutions. Anesth Analg. Apr 1998;86(4):896-906. *Not eligible exposure.*
2063. Owen BD, Keene K, Olson S. An ergonomic approach to reducing back/shoulder stress in hospital nursing personnel: a five year follow up. Int J Nurs Stud. Mar 2002;39(3):295-302. *Not eligible exposure.*
2064. Owen C, Tarantello C, Jones M, Tennant C. Violence and aggression in psychiatric units. Psychiatr Serv. Nov 1998;49(11):1452-1457. *Not eligible target population.*
2065. Owen L. The named nurse: patient and nurse expectations. Prof Nurse. Aug 1997;12(11):769-771. *Not eligible target population.*

2066. Oz F. Impact of training on empathic communication skills and tendency of nurses. Clin Excell Nurse Pract. 2001;5(1):44-51. *Not eligible target population.*
2067. Ozkarahan I. An integrated nurse scheduling model. J Soc Health Syst. 1991;3(2):79-101. *No association tested.*
2069. Pacini CM. Synergy: a framework for leadership development and transformation. Crit Care Nurs Clin North Am. Jun 2005;17(2):113-119, ix. *No association tested.*
2070. Padilla-Harris C. Night fever. Nurs Stand. Oct 17-23 2001;16(5):23. *News.*
2071. Padmam R. Extroversion, neuroticism and job satisfaction: a comparative study of staff nurses and students. Nurs J India. Mar 1995;86(3):65-68. *Not eligible target population.*
2072. Page B. Where have all the nurses gone? Can Oncol Nurs J. May 1998;8(2):91-92. *Editorial.*
2073. Page D. Paramedics--above & beyond. Hosp Health Netw. Mar 2000;74(3):30. *Comment.*
2074. Page JS. Nurse staffing and outcomes: differentiating care delivery by education preparation. J Nurs Adm. Jan 2005;35(1):7. *Comment.*
2075. Page L, McCourt C, Beake S, Vail A, Hewison J. Clinical interventions and outcomes of One-to-One midwifery practice. J Public Health Med. Sep 1999;21(3):243-248. *Not eligible target population.*
2076. Page M. Tailoring nursing models to clients' needs. Using the Roper, Logan and Tierney model after discharge. Prof Nurse. Feb 1995;10(5):284-288. *Comment.*
2077. Paget-Wilkes M. Self-rostering on a neonatal intensive care unit. Nurs Stand. Feb 19 1997;11(22):39-42. *Not eligible target population.*
2078. Pallarito K. Rule delay leaves foreign nurses in limbo. Mod Healthc. Dec 3 1990;20(48):6. *News.*
2079. Pallarito K. Labor proposes rules governing foreign nurses. Mod Healthc. Jul 23 1990;20(29):4. *News.*
2080. Palmer J. Eight- and 12-hour shifts: comparing nurses' behavior patterns. Nurs Manage. Sep 1991;22(9):42-44. *No association tested.*
2081. Panagiotopoulou K, Kerr SM. Pressure area care: an exploration of Greek nurses' knowledge and practice. J Adv Nurs. Nov 2002;40(3):285-296. *Not eligible target population.*
2082. Papadatou D, Martinson IM, Chung PM. Caring for dying children: a comparative study of nurses' experiences in Greece and Hong Kong. Cancer Nurs. Oct 2001;24(5):402-412. *Not eligible target population.*
2083. Pape TM. Applying airline safety practices to medication administration. Medsurg Nurs. Apr 2003;12(2):77-93; quiz 94. *Not eligible exposure.*
2084. Pape TM, Guerra DM, Muzquiz M, Bryant JB, Ingram M, Schranner B, Alcala A, Sharp J, Bishop D, Carreno E, Welker J. Innovative approaches to reducing nurses' distractions during medication administration. J Contin Educ Nurs. May-Jun 2005;36(3):108-116; quiz 141-102. *Not eligible exposure.*
2085. Paredes SD, Frank DI. Nurse/parent role perceptions in care of neonatal intensive care unit infants: implications for the advanced practice nurse. Clin Excell Nurse Pract. Sep 2000;4(5):294-301. *Not eligible exposure.*
2086. Parish C. Minimum effort. Nurs Stand. Jul 3-9 2002;16(42):12-13. *Comment.*
2087. Park EK, Song M. Communication barriers perceived by older patients and nurses. Int J Nurs Stud. Feb 2005;42(2):159-166. *Not eligible target population.*
2088. Park HA, Park JH. Development of a computerized patient classification and staffing system. Stud Health Technol Inform. 1997;46:508-511. *Not eligible target population.*
2089. Parker MT, Leggett-Frazier N, Vincent PA, Swanson MS. The impact of an educational program on improving diabetes knowledge and changing behaviors of nurses in long-term care facilities. Diabetes Educ. Nov-Dec 1995;21(6):541-545. *Not eligible exposure.*
2090. Parse RR. Language: words reflect and cocreate meaning. Nurs Sci Q. Jul 2000;13(3):187. *Editorial.*
2091. Parsons LC. Building RN confidence for delegation decision-making skills in practice. J Nurses Staff Dev. Nov-Dec 1999;15(6):263-269. *Not eligible exposure.*
2092. Parsons ML, Scaltrito S, Vondle DP. A program to manage nurse staffing costs. Nurs Manage. Oct 1990;21(10):42-44. *No association tested.*
2093. Parsons ML, Stonestreet J. Staff nurse retention. Laying the groundwork by listening. Nurs Leadersh Forum. Spring 2004;8(3):107-113. *No association tested.*
2094. Paterson I. Service assistants threaten nursing. Nurs N Z. May 1997;3(4):32-33. *Not eligible target population.*
2095. Patrician PA. Multiple imputation for missing data. Res Nurs Health. Feb 2002;25(1):76-84. *Review.*
2096. Patterson B. Safe patient care legislation addresses growing national problem. Mich Nurse. Aug 2004:5, 16. *Review.*
2097. Patterson P. PACU staffing. Staffing the recovery areas an art as well as a science. OR Manager. Apr 1998;14(4):1, 19-22. *Not eligible target population.*
2098. Patterson P. How ORs manage on-call varies by local market. OR Manager. Feb 2000;16(2):1, 8-11. *Comment.*
2099. Payne D. Time for judgement. Nurs Times. Jun 3-9 1998;94(22):15. *Comment.*
2100. Payne S, Hardey M, Coleman P. Interactions between nurses during handovers in elderly care. J Adv Nurs. Aug 2000;32(2):277-285. *Not eligible target population.*
2101. Pearce L. Your hospital needs you. Nurs Stand. Nov 1-7 2000;15(7):14-15. *Comment.*
2102. Pederson C. Nonpharmacologic interventions to manage children's pain: immediate and short-term effects of a continuing education program. J Contin Educ Nurs. May-Jun 1996;27(3):131-140. *Not eligible exposure.*

2103. Peerson A, Aitken R, Manias E, Parker J, Wong K. Agency nursing in Melbourne, Australia: a telephone survey of hospital and agency managers. J Adv Nurs. Dec 2002;40(5):504-512. *Not eligible target population.*
2104. Penticuff JH, Arheart KL. Effectiveness of an intervention to improve parent-professional collaboration in neonatal intensive care. J Perinat Neonatal Nurs. Apr-Jun 2005;19(2):187-202. *Not eligible outcomes.*
2105. Pepper GA. Errors in drug administration by nurses. Am J Health Syst Pharm. Feb 15 1995;52(4):390-395. *No association tested.*
2106. Pereira LJ, Lee GM, Wade KJ. An evaluation of five protocols for surgical handwashing in relation to skin condition and microbial counts. J Hosp Infect. May 1997;36(1):49-65. *Not eligible exposure.*
2107. Perez PG, Herrick LM. Doulas: exploring their roles with parents, hospitals, & nurses. AWHONN Lifelines. Apr 1998;2(2):54-55. *Comment.*
2108. Perkins L. Support grows for Massachusetts RN staffing bill. Revolution. Oct-Nov 2003;4(5):5. *News.*
2109. Perlow M, Rudolth LG. Registered nurse perceptions of nursing practice. Kentucky nurse Oct-Dec 1995;43(4):28-9. *Not peer reviewed.*
2110. Perras ST, Mattern M. A practical approach to TQI. Anna J. Apr 1994;21(2):129-136, 143. *Not eligible outcomes.*
2111. Perry K. The problem-free assignment. Nursing. Jun 1998;28(6):86-87. *Not eligible target population.*
2112. Perry K. Time to try travel nurses? Nurs Manage. Feb 1999;30(2):39-40. *No association tested.*
2113. Perry L. Screening swallowing function of patients with acute stroke. Part one: Identification, implementation and initial evaluation of a screening tool for use by nurses. J Clin Nurs. Jul 2001;10(4):463-473. *Not eligible target population.*
2114. Persuhn PG. Job sharing: two who made it work. Am J Nurs. Sep 1992;92(9):75-80. *Comment.*
2115. Peters N, Cox J. Could a process improvement program improve your quality assurance. Case Manager. Mar-Apr 2000;11(2):78-81. *No association tested.*
2116. Petersen MF, Cohen J, Parsons V. Family-centered care: do we practice what we preach? J Obstet Gynecol Neonatal Nurs. Jul-Aug 2004;33(4):421-427. *Not eligible exposure.*
2117. Petroff J. Registered nurses: do you have a right to overtime pay? Ohio Nurses Rev. Aug 1996;71(7):13. *Comment.*
2118. Petty DS. ECT in the PACU? It's possible. Nurs Manage. Nov 2000;31(11):42-44. *Comment.*
2119. Phillips CY. Postdischarge follow-up care: effect on patient outcomes. J Nurs Care Qual. Jul 1993;7(4):64-72. *Not eligible exposure.*
2120. Phillips H, Brunke L. Self scheduling helps nurses balance their personal & professional lives. RNABC News. Jul-Aug 1990;22(4):15-16. *No association tested.*
2121. Phillips M. Telemedicine in the neonatal intensive care unit. Pediatr Nurs. Mar-Apr 1999;25(2):185-186, 189. *Not eligible exposure.*
2122. Phipps W, Honghong W, Min Y, Burgess J, Pellico L, Watkins CW, Guoping H, Williams A. Risk of medical sharps injuries among Chinese nurses. Am J Infect Control. Aug 2002;30(5):277-282. *Not eligible target population.*
2123. Picton CE. An exploration of family-centred care in Neuman's model with regard to the care of the critically ill adult in an accident and emergency setting. Accid Emerg Nurs. Jan 1995;3(1):33-37. *Comment.*
2124. Pieper B, Mattern JC. Critical care nurses' knowledge of pressure ulcer prevention, staging and description. Ostomy Wound Manage. Mar 1997;43(2):22-26, 28, 30-21. *Not eligible exposure.*
2125. Pillar B, Jarjoura D. Assessing the impact of reengineering on nursing. J Nurs Adm. May 1999;29(5):57-64. *Not eligible outcomes.*
2126. Piloian BB. Alternative staffing strategies for community hospital-based diabetes education programs. Diabetes Educ. Jul-Aug 1992;18(4):293, 295-296. *Not eligible exposure.*
2127. Piltz-Kirkby M. The nursing assignment pattern study in clinical practice. Nurs Manage. May 1991;22(5):96HH, 96LL, 96NN. *No association tested.*
2128. Pink GH, Hall LM, Leatt P. Canadian-trained nurses in North Carolina. Healthcare Quarterly 2004;7(3): Longwoods Review, Volume 2, Number 2):2-11. *Not relevant.*
2129. Pinkerton S. Payoffs from investments: improving, transforming, and building skills. Nurs Econ. Sep-Oct 2002;20(5):244, 248. *Comment.*
2130. Pinnock D. Experience of being a shift co-ordinator. Nurs Crit Care. Sep-Oct 1998;3(5):227-236. *Not eligible target population.*
2131. Pioro MH, Landefeld CS, Brennan PF, Daly B, Fortinsky RH, Kim U, Rosenthal GE. Outcomes-based trial of an inpatient nurse practitioner service for general medical patients. J Eval Clin Pract. Feb 2001;7(1):21-33. *Not eligible exposure.*
2132. Pirret AM. Utilizing TISS to differentiate between intensive care and high-dependency patients and to identify nursing skill requirements. Intensive Crit Care Nurs. Feb 2002;18(1):19-26. *Not eligible target population.*
2133. Pisarski A, Bohle P. Effects of supervisor support and coping on shiftwork tolerance. J Hum Ergol (Tokyo). Dec 2001;30(1-2):363-368. *Not eligible target population.*
2134. Pisarski A, Bohle P, Callan VJ. Effects of coping strategies, social support and work-nonwork conflict on shift worker's health. Scand J Work Environ Health. 1998;24 Suppl 3:141-145. *Not eligible target population.*
2135. Pitt HA, Murray KP, Bowman HM, Coleman J, Gordon TA, Yeo CJ, Lillemoe KD, Cameron JL. Clinical pathway implementation improves outcomes for complex biliary surgery. Surgery. Oct 1999;126(4):751-756; discussion 756-758. *Not eligible exposure.*

2136. Pizer CM, Collard AF, Bishop CE, James SM, Bonaparte B. Recruiting and employing foreign nurse graduates in a large public hospital system. Hosp Health Serv Adm. Spring 1994;39(1):31-46. *Not eligible exposure.*
2137. Place B, Cornock M. Critical timing. Nurs Times. Jun 25-Jul 1 1997;93(26):26-28. *Not eligible target population.*
2138. Plant ML, Plant MA, Foster J. Stress, alcohol, tobacco and illicit drug use amongst nurses: a Scottish study. J Adv Nurs. Sep 1992;17(9):1057-1067. *Not eligible target population.*
2139. Plati C, Lanara VA, Katostaras T, Mantas J. Nursing absenteeism--one determining factor for the staffing plan. Scand J Caring Sci. 1994;8(3):143-148. *Not eligible outcomes.*
2140. Plowright C. Auditing quality of nursing care. Intensive Crit Care Nurs. Dec 1995;11(6):354-359. *No association tested.*
2141. Plowright C, O'Riordan B, Scott G. The perception of ward-based nurses seconded into an Outreach Service. Nurs Crit Care. May-Jun 2005;10(3):143-149. *Not eligible target population.*
2142. Plum SD. Three Denver nurses may face prison in a case that bodes ill for the profession. Revolution. Summer 1997;7(2):11-12. *Comment.*
2143. Plum SD. Medication error--nurses indicated. Nursing. Jul 1997;27(7):34-35. *Comment.*
2144. Poirrier GP, Granger M, Todaro M. ACE--Alliance for Clinical Enhancement: a collaborative model. Nursingconnections. Fall 1993;6(3):53-61. *Not eligible exposure.*
2145. Poissonnet CM, Iwatsubo Y, Cosquer M, Quera Salva MA, Caillard JF, Veron M. A cross-sectional study of the health effects of work schedules on 3212 hospital workers in France: implications for the new French work schedules policy. J Hum Ergol (Tokyo). Dec 2001;30(1-2):387-391. *Not eligible target population.*
2146. Polkki T, Vehvilainen-Julkunen K, Pietila AM. Nonpharmacological methods in relieving children's postoperative pain: a survey on hospital nurses in Finland. J Adv Nurs. May 2001;34(4):483-492. *Not eligible target population.*
2147. Pongsatha S, Morakote N, Sribanditmongkol N, Chaovisitsaree S. Symptoms of estrogen deficiency in nursing personnel in Maharaj Nakorn Chiang Mai Hospital. J Med Assoc Thai. Apr 2004;87(4):405-409. *Not eligible target population.*
2148. Pope BB. The Synergy match-up. Nurs Manage. May 2002;33(5):38-41. *Comment.*
2149. Pope M. A mix-up of tubes. Medication administered through the wrong access line. Am J Nurs. Apr 2002;102(4):23. *Case Reports.*
2150. Poroch D, McIntosh W. Barriers to assertive skills in nurses. Aust N Z J Ment Health Nurs. Sep 1995;4(3):113-123. *Not eligible target population.*
2151. Poquette MC, Platte J, Casey K. Meeting the staffing challenge: development of a voluntary on-call system. Critical care nursing quarterly Nov 1992;15(3):29-36. *Not relevant.*
2152. Porter-O'Grady T. Mission with a margin. Nurs Manage. Jun 2000;31(6):8. *Editorial.*
2153. Potter P, Boxerman S, Wolf L, Marshall J, Grayson D, Sledge J, Evanoff B. Mapping the nursing process: a new approach for understanding the work of nursing. J Nurs Adm. Feb 2004;34(2):101-109. *Not eligible exposure.*
2154. Potter P, Wolf L, Boxerman S, et al. Understanding the cognitive work of nursing in the acute care environment. Journal of Nursing Administration Jul-Aug 2005;35(7/8):327-35. *Not relevant*
2155. Powell C, Walker J, Christie M, Mitchell-Pedersen L, Rauscher C. The unexpected relocation of elderly in-patients in response to a threatened strike. J Adv Nurs. Apr 1990;15(4):423-429. *Not eligible exposure.*
2156. Powers BA. Everyday ethics in assisted living facilitites: a framework for assessing resident-focused issues. J Gerontol Nurs. Jan 2005;31(1):31-37. *Case Reports.*
2157. Powers J, Daniels D. Turning points: implementing kinetic therapy in the ICU. Nurs Manage. May 2004;35(5):suppl 1-7; quiz 8. *Not eligible exposure.*
2158. Powers JL. Accepting and refusing assignments. Nurs Manage. Sep 1993;24(9):64-66, 68. *Comment.*
2159. Pownall M. Shifting ground. Nurs Times. Oct 31-Nov 6 1990;86(44):19. *Comment.*
2160. Prater M. Victory for Youngstown nurses. New contract ensures safe hours, safe staffing and quality patient care for RNs. Ohio Nurses Rev. Aug 2001;76(7):1. *Comment.*
2161. Pratt R, Burr G, Leelarthaepin B, Blizard P, Walsh S. The effects of All-RN and RN-EN staffing on the quality and cost of patient care. Aust J Adv Nurs. Mar-May 1993;10(3):27-39. *Case Reports.*
2162. Prescott PA, Soeken KL. Measuring nursing intensity in ambulatory care. Part II: Developing and testing PINAC. Nurs Econ. Mar-Apr 1996;14(2):86-91, 116. *Not eligible target population.*
2163. Prescott PA, Soeken KL, Ryan JW. Measuring patient intensity. A reliability study. Eval Health Prof. Sep 1989;12(3):255-269. *Not eligible year.*
2164. Price C. A national uprising. United actions push mandatory overtime, inadequate staffing to forefront. Am J Nurs. Dec 2000;100(12):75-76. *Review.*
2165. Pringle D. What do nursing and the law have in common: retention. Can J Nurs Leadersh. Mar 2004;17(1):1-2, 4. *Editorial.*
2166. Procter S. It all depends. Health Serv J. Jan 21 1993;103(5336):27. *Not eligible target population.*
2167. Proctor M. Medicalisation of life: are nurses involved? Contemp Nurse. Sep-Dec 2000;9(3-4):263-264. *Case Reports.*
2168. Proehl JA. Developing emergency nursing competence. Nurs Clin North Am. Mar 2002;37(1):89-96, vii. *Not eligible exposure.*
2169. Pronger L. Floating: sink or swim. Can Nurse. Dec 1995;91(11):28-32. *No association tested.*
2170. Pronitis-Ruotolo D. Surviving the night shift. Am J Nurs. Jul 2001;101(7):63-65, 67-68. *Comment.*
2171. Pronovost P, Wu AW, Dorman T, Morlock L. Building safety into ICU care. J Crit Care. Jun 2002;17(2):78-85. *Case Reports.*

2172. Puckett F. Medication-management component of a point-of-care information system. Am J Health Syst Pharm. Jun 15 1995;52(12):1305-1309. *Not eligible exposure.*
2173. Pullenayegum S, Fielding B, Du Plessis E, Peate I. The value of the role of the rehabilitation assistant. Br J Nurs. Jul 28-Aug 10 2005;14(14):778-784. *Not eligible target population.*
2174. Pumford S, Pettigrew C, Sargent J. Revising routines. Nurs Times. Aug 28-Sep 3 1991;87(35):31-33. *Comment.*
2175. Puntillo K, Neighbor M, O'Neil N, Nixon R. Accuracy of emergency nurses in assessment of patients' pain. Pain Manag Nurs. Dec 2003;4(4):171-175. *Not eligible exposure.*
2176. Purnell LD. A survey of emergency department triage in 185 hospitals: physical facilities, fast-track systems, patient-classification systems, waiting times, and qualification, training, and skills of triage personnel. J Emerg Nurs. Dec 1991;17(6):402-407. *Not eligible outcomes.*
2177. Quigley P, Janzen SK, King I, Goucher E. Nurse staffing and patient outcomes from one acute care setting within the Department of Veterans' Affairs. Fla Nurse. Jun 1999;47(2):34. *No association tested.*
2178. Quinn S. Making a nonsense of training. RCM Midwives. Jul 2004;7(7):312. *Not eligible target population.*
2179. Rae CP, Gallagher G, Watson S, Kinsella J. An audit of patient perception compared with medical and nursing staff estimation of pain during burn dressing changes. Eur J Anaesthesiol. Jan 2000;17(1):43-45. *Not eligible target population.*
2180. Rainer SR. Ratio bill gains support. N J Nurse. Sep-Oct 2003;33(7):1, 12. *News.*
2181. Raines DA. Choices of neonatal nurses in ambiguous clinical situations. Neonatal Netw. Feb 1996;15(1):17-25. *Not eligible exposure.*
2182. Ralston R. Clinical governance. One year on: Part 2. Pract Midwife. Jun 2001;4(6):33-34. *Not eligible target population.*
2183. Rambur B, McIntosh B, Palumbo MV, Reinier K. Education as a determinant of career retention and job satisfaction among registered nurses. J Nurs Scholarsh. 2005;37(2):185-192. *Not Eligible Exposure.*
2184. Ramritu P, Courtney M, Stanley T, Finlayson K. Experiences of the generalist nurse caring for adolescents with mental health problems. J Child Health Care. Dec 2002;6(4):229-244. *Not eligible target population.*
2185. Ramsey P, Cathelyn J, Gugliotta B, Glenn LL. Restricted versus open ICUs. Nurs Manage. Jan 2000;31(1):42-44. *Not eligible exposure.*
2186. Ramudu L, Bellet B, Higgs J, Latimer C, Smith R. How effectively do we use double staff time? Aust J Adv Nurs. Mar-May 1994;11(3):5-10. *Not eligible target population.*
2187. Randolph AG, Zollo MB, Wigton RS, Yeh TS. Factors explaining variability among caregivers in the intent to restrict life-support interventions in a pediatric intensive care unit. Crit Care Med. Mar 1997;25(3):435-439. *Not eligible exposure.*
2188. Rankin JM. 'Patient satisfaction': knowledge for ruling hospital reform--an institutional ethnography. Nurs Inq. Mar 2003;10(1):57-65. *Comment.*
2189. Rapala K. Mentoring staff members as patient safety leaders: the Clarian Safe Passage Program. Crit Care Nurs Clin North Am. Jun 2005;17(2):121-126, ix. *No association tested.*
2190. Rasmussen BH, Sandman PO. Nurses' work in a hospice and in an oncological unit in Sweden. Hosp J. 2000;15(1):53-75. *Not eligible target population.*
2191. Rauhala A, Fagerstrom L. Determining optimal nursing intensity: the RAFAELA method. J Adv Nurs. Feb 2004;45(4):351-359. *Not eligible target population.*
2192. Rawal N, Das G, Kishen M. Assessment of contraceptive services in a maternity unit of a district general hospital in the UK. J Obstet Gynaecol. Feb 2005;25(2):179-181. *Not eligible target population.*
2193. Rawlinson D. Audit of nutritional practice and knowledge. Prof Nurse. Feb 1998;13(5):291-294. *Not eligible target population.*
2194. Rawnsley MM. Response to Kim's human living concept as a unifying perspective for nursing. Nurs Sci Q. Jan 2000;13(1):41-44. *Comment.*
2195. Ray CE, Jagim M, Agnew J, McKay JI, Sheehy S. ENA's new guidelines for determining emergency department nurse staffing. J Emerg Nurs. Jun 2003;29(3):245-253. *Guidelines.*
2196. Rayens MK, Svavarsdottir EK. A new methodological approach in nursing research: an actor, partner, and interaction effect model for family outcomes. Res Nurs Health. Oct 2003;26(5):409-419. *Not eligible exposure.*
2197. Ream KA. California to mandate nurse-patient staffing ratio. J Emerg Nurs. Dec 2000;26(6):29A. *News.*
2198. Redfern S, Norman I. Quality of nursing care perceived by patients and their nurses: an application of the critical incident technique. Part 2. J Clin Nurs. Jul 1999;8(4):414-421. *Not eligible target population.*
2199. Redfern S, Norman I. Quality of nursing care perceived by patients and their nurses: an application of the critical incident technique. Part 1. J Clin Nurs. Jul 1999;8(4):407-413. *Not eligible target population.*
2200. Redshaw ME, Harris A. Nursing skill mix in neonatal care. J Nurs Manag. Jan 1994;2(1):15-23. *Not eligible target population.*
2201. Redshaw ME, Harris A, Ingram JC. Nursing and medical staffing in neonatal units. J Nurs Manag. Sep 1993;1(5):221-228. *Not eligible target population.*
2202. Reed J, Morgan D. Discharging older people from hospital to care homes: implications for nursing. J Adv Nurs. Apr 1999;29(4):819-825. *Not eligible target population.*

2203. Reed JL, Lyne M. Inpatient care of mentally ill people in prison: results of a year's programme of semistructured inspections. Bmj. Apr 15 2000;320(7241):1031-1034. *Not eligible target population.*
2204. Reed L, Blegen MA, Goode CS. Adverse patient occurrences as a measure of nursing care quality. J Nurs Adm. May 1998;28(5):62-69. *Not eligible exposure.*
2205. Reed P, Smith P, Fletcher M, Bradding A. Promoting the dignity of the child in hospital. Nurs Ethics. Jan 2003;10(1):67-76. *Not eligible target population.*
2206. Reeder L. "Coopetition," perks and price tags: stakes grow higher as the workforce crisis worsens. Healthc Leadersh Manag Rep. Mar 2002;10(3):1-9. *Review.*
2207. Reedy JE. Transfer of a patient with a ventricular assist device to a non-critical care area. Heart Lung. Jan-Feb 1993;22(1):71-76. *Case Reports.*
2208. Rees C, Lehane M. Witnessing violence to staff: a study of nurses' experiences. Nurs Stand. Dec 18 1996;11(13-15):45-47. *Not eligible target population.*
2209. Reeve K, Calabro K, AdamsMcNeill J. Tobacco cessation intervention in a nurse practitioner managed clinic. Journal of the American Academy of Nurse Practitioners May 2000;12(5):163-9. *Not relevant.*
2210. Regan S. Fewer graduates able to find full-time employment. Nursing BC Dec 2004;36(5):14-5. *Not peer reviewed.*
2211. Reichelt PA, Larson PA. Preimplementation financial evaluation of a structural work change: cost analysis of an innovative staffing schedule. Nurs Adm Q. Spring 1994;18(3):68-73. *No association tested.*
2212. Reid C. Developing a tissue viability nursing assistant role. Nurs Stand. Apr 21-27 2004;18(32):68-72. *Not eligible target population.*
2213. Reid N, Robinson G, Todd C. The 12-hour shift: the views of nurse educators and students. J Adv Nurs. May 1994;19(5):938-946. *Not eligible target population.*
2214. Reid N, Todd C, Robinson G. Educational activities on wards under 12 hour shifts. Int J Nurs Stud. 1991;28(1):47-54. *Not eligible target population.*
2215. Reid T. Work well campaign. A suitable case for treatment. Nurs Times. Jun 14-20 1995;91(24):28-30. *Case Reports.*
2216. Reilly P. A case for more nurses. JAMA study: chance of dying increases with more patients under nurse's care. Mod Healthc. Oct 28 2002;32(43):14. *News.*
2217. Reilly P. In need of nurses. Illinois hospital makes name for itself through RN retention, recruitment. Mod Healthc. Nov 24 2003;33(47):S19-20. *Comment.*
2218. Reilly P. Importing controversy. U.S. hospitals' recruitment of foreign nurses stirs debate as poorer countries struggle with staffing shortages of their own. Mod Healthc. Mar 31 2003;33(13):20-24. *Comment.*
2219. Reilly P. Foreign certification. AHA seeks delay on regs for immigrant nurses. Mod Healthc. Feb 23 2004;34(8):17. *News.*
2220. Reis Miranda D, Moreno R, Iapichino G. Nine equivalents of nursing manpower use score (NEMS). Intensive Care Med. Jul 1997;23(7):760-765. *Not eligible target population.*
2221. Reisdorfer JT. Building a patient-focused care unit. Nurs Manage. Oct 1996;27(10):38, 40, 42 passim. *No association tested.*
2222. Renaud M. Mandatory overtime: whose right is right? Revolution. Jul-Aug 2000;1(4):31. *Comment.*
2223. Render ML, Kim HM, Welsh DE, Timmons S, Johnston J, Hui S, Connors AF, Jr., Wagner D, Daley J, Hofer TP. Automated intensive care unit risk adjustment: results from a National Veterans Affairs study. Crit Care Med. Jun 2003;31(6):1638-1646. *Not eligible exposure.*
2224. Retsas A, Pinikahana J. Manual handling activities and injuries among nurses: an Australian hospital study. J Adv Nurs. Apr 2000;31(4):875-883. *Not eligible target population.*
2225. Reynolds M, Thomsen C, Black L, Moody R. The nuts and bolts of organizing and initiating a pediatric transport team. The Sutter Memorial experience. Crit Care Clin. Jul 1992;8(3):465-480. *No association tested.*
2226. Ricci M, Goldman AP, de Leval MR, Cohen GA, Devaney F, Carthey J. Pitfalls of adverse event reporting in paediatric cardiac intensive care. Arch Dis Child. Sep 2004;89(9):856-859. *Not eligible exposure.*
2227. Rich K. Inhospital cardiac arrest: pre-event variables and nursing response. Clin Nurse Spec. May 1999;13(3):147-153; quiz 154-146. *Not eligible exposure.*
2228. Richardson A, Burnand V, Colley H, Coulter C. Ward nurses' evaluation of critical care outreach. Nurs Crit Care. Jan-Feb 2004;9(1):28-33. *Not eligible target population.*
2229. Richardson A, Dabner N, Curtis S. Twelve-hour shift on ITU: a nursing evaluation. Nurs Crit Care. May-Jun 2003;8(3):103-108. *Not eligible target population.*
2230. Richardson JR, Braitberg G, Yeoh MJ. Multidisciplinary assessment at triage: a new way forward. Emerg Med Australas. Feb 2004;16(1):41-46. *Not eligible target population.*
2231. Richardson T. Patient focused care: consultants, foundations, educational programs. Revolution. Spring 1996;6(1):35-38. *Comment.*
2232. Richie K, Peeler C. Plug into success with centralized flex staffing. Nurs Manage. Feb 2005;36(2):18. *Review.*
2233. Ricketts T. General satisfaction and satisfaction with nursing communication on an adult psychiatric ward. J Adv Nurs. Sep 1996;24(3):479-487. *Not eligible target population.*
2234. Riddell AM, Charig MJ. A survey of current practice in out of hours percutaneous nephrostomy insertion in the United Kingdom. Clin Radiol. Dec 2002;57(12):1067-1069. *Not eligible target population.*

2235. Ridge KW, Jenkins DB, Noyce PR, Barber ND. Medication errors during hospital drug rounds. Qual Health Care. Dec 1995;4(4):240-243. *Not eligible target population.*
2236. Ridley S, Biggam M, Stone P. Cost of intensive therapy. A description of methodology and initial results. Anaesthesia. Jul 1991;46(7):523-530. *Not eligible target population.*
2237. Riley J. Cross-training: maximizing staffing flexibility. Nurs Manage. Jun 1990;21(6):48I-48J. *No association tested.*
2238. Riley V. Dangerous liaison. Nurs Times. Nov 11-17 1998;94(45):30-31. *Case Reports.*
2239. Ringerman ES, Ventura S. An outcomes approach to skill mix change in critical care. Nurs Manage. Oct 2000;31(10):42-46. *No association tested.*
2240. Ritter-Teitel J. Registered nurse hours worked per patient day: the key to assessing staffing effectiveness and ensuring patient safety. J Nurs Adm. Apr 2004;34(4):167-169. *No association tested.*
2241. Ritz DA, Dugan MF. 12-hour shifts. A scheduling alternative for ORs. Aorn J. Mar 1990;51(3):810-811, 813, 815. *No association tested.*
2242. Rivares AV, Navarrete IG, Pueyo CG, Torrent AM, Duran MM, Gatius JR, Mussol LR, Solano M. Evaluation of relationships between haemodialysis unit professionals. Edtna Erca J. Jan-Mar 2004;30(1):27-30. *Not eligible target population.*
2243. Rivers FM, Lavallee SM, Nenninger KM, Nichols D. Evaluation of a bed utilization system in a surgical nursing section. Mil Med. Dec 1998;163(12):839-843. *Not eligible exposure.*
2244. Robb EA, Determan AC, Lampat LR, Scherbring MJ, Slifka RM, Smith NA. Self-scheduling: satisfaction guaranteed? Nurs Manage. Jul 2003;34(7):16-18. *Comment.*
2245. Roberts D. Competence increases comfort for float nurses. Medsurg Nurs. Jun 2004;13(3):142. *Editorial.*
2246. Roberts G, Fielding P. No vacancies. Nurs Stand. Jan 13-19 1999;13(17):16. *News.*
2247. Roberts M, Potter J, McColl J, Reilly J. Can prescription of sip-feed supplements increase energy intake in hospitalised older people with medical problems? Br J Nutr. Aug 2003;90(2):425-429. *Not eligible exposure.*
2248. Robertson MA, Molyneux EM. Triage in the developing world--can it be done? Arch Dis Child. Sep 2001;85(3):208-213. *Not eligible target population.*
2249. Robertson MS, Cade JF, Clancy RL. Helicobacter pylori infection in intensive care: increased prevalence and a new nosocomial infection. Crit Care Med. Jul 1999;27(7):1276-1280. *Not eligible target population.*
2250. Robertson RH, Dowd SB, Hassan M. Skill-specific staffing intensity and the cost of hospital care. Health Care Manage Rev. Fall 1997;22(4):61-71. *Not eligible outcomes.*
2251. Robinson A, Street A. Improving networks between acute care nurses and an aged care assessment team. J Clin Nurs. May 2004;13(4):486-496. *Not eligible exposure.*
2252. Robinson CA. Magnet nursing services recognition: transforming the critical care environment. AACN Clin Issues. Aug 2001;12(3):411-423. *Not eligible exposure.*
2253. Robinson J. Education. Think pink. Nurs Stand. Nov 14-20 1990;5(8):43. *No association tested.*
2254. Robinson K. Nursing's perfect storm--staff shortages and patient ratios. J Emerg Nurs. Jun 2003;29(3):199-200. *Review.*
2255. Robinson S. Florence of Arabia. Nurs Times. Oct 18-24 1995;91(42):46-47. *Comment.*
2256. Robinson SE, Roth SL, Keim J, et al. Nurse burnout: work related and demographic factors as culprits. Research in nursing & health Jun 1991;14(3):223-8. *Not relevant.*
2257. Robinson SE, Roth SL, Keim J, Levenson M, Flentje JR, Bashor K. Nurse burnout: work related and demographic factors as culprits. Res Nurs Health. Jun 1991;14(3):223-228. *Not eligible outcomes.*
2258. Rocker G, Cook D, Sjokvist P, Weaver B, Finfer S, McDonald E, Marshall J, Kirby A, Levy M, Dodek P, Heyland D, Guyatt G. Clinician predictions of intensive care unit mortality. Crit Care Med. May 2004;32(5):1149-1154. *Not eligible exposure.*
2259. Rodriguez L. Recruitment and retention. Four ways to make a difference. Nurs Staff Dev Insid. Jan-Feb 1992;1(1):4, 7. *Comment.*
2260. Rodriguez RM, Dresden GM, Young JC. Patient and provider attitudes toward commercial television film crews in the emergency department. Acad Emerg Med. Jul 2001;8(7):740-745. *Not eligible exposure.*
2261. Rogers AE, Hwang WT, Scott LD, Aiken LH, Dinges DF. The working hours of hospital staff nurses and patient safety. Health Aff (Millwood). Jul-Aug 2004;23(4):202-212. *Not eligible outcomes.*
2262. Rogers AE, Hwang W, Scott LD. The effects of work breaks on staff nurse performance. Journal of Nursing Administration Nov 2004;34(11):512-9. *Not relevant.*
2263. Rogers R. The Beverly Allitt case. Qualified in caring? Nurs Stand. Feb 23-Mar 1 1994;8(22):21-22. *Not eligible target population.*
2264. Rohland P. N.J. passes bill to end mandatory overtime. Revolution. Jul-Aug 2000;1(4):10-11. *News.*
2265. Rollins D. Study side notes. Nurs Manage. Sep 2003;34(9):10. *Comment.*
2266. Rollins G. Workforce. Who's exempt? New overtime rules still getting scrutiny from nurse unions and lawmakers. Hosp Health Netw. Apr 2005;79(4):30. *News.*
2267. Romea S, Alkiza ME, Ramon JM, Oromi J. Risk for occupational transmission of HIV infection among health care workers. Study in a Spanish hospital. Eur J Epidemiol. Apr 1995;11(2):225-229. *Not eligible target population.*
2268. Ronsmans C, Etard JF, Walraven G, Hoj L, Dumont A, de Bernis L, Kodio B. Maternal mortality and access to obstetric services in West Africa. Trop Med Int Health. Oct 2003;8(10):940-948. *Not eligible target population.*
2269. Roscoe J, Haig N. Shift work. Planning shift patterns. Nurs Times. Sep 19-25 1990;86(38):31-33. *Comment.*

2270. Roseman C, Booker JM. Workload and environmental factors in hospital medication errors. Nurs Res. Jul-Aug 1995;44(4):226-230. *Not eligible outcomes.*
2271. Rosen LF. The changing face of staffing--UAPs. Todays Surg Nurse. May-Jun 1999;21(3):39-40. *Comment.*
2272. Rosenbach ML. CRNA vacancy rates in US hospitals. Nurse anesthesia Jun 1990;1(2):61-70. *Not relevant.*
2273. Rosenfeld P, Harrington C. Hospital care for elderly. Am J Nurs. May 2003;103(5):115. *Review.*
2274. Rosenstein AH, O'Daniel M. Study links disruptive behavior to negative patient outcomes. OR Manager. Mar 2005;21(3):1, 20, 22. *Comment.*
2275. Rosenthal VD, Guzman S, Safdar N. Effect of education and performance feedback on rates of catheter-associated urinary tract infection in intensive care units in Argentina. Infect Control Hosp Epidemiol. Jan 2004;25(1):47-50. *Not eligible exposure.*
2276. Rothberg MB, Abraham I, Lindenauer PK, Rose DN. Improving nurse-to-patient staffing ratios as a cost-effective safety intervention. Med Care. Aug 2005;43(8):785-791. *Review*.
2277. Rothman LW. Implementing patient-focused care: success indicators for measuring satisfaction. Recruit Retent Restruct Rep. Sep 1995;8(9):1-6. *No association tested.*
2278. Rothrock JC, Smith DA. Selecting the perioperative patient focused model. Aorn J. May 2000;71(5):1030-1034, 1036-1037. *Not eligible exposure.*
2279. Routh BA, Stafford R. Implementing a patient-focused care delivery model. J Nurs Staff Dev. Jul-Aug 1996;12(4):208-212. *No association tested.*
2280. Rowe J. Making oneself at home? Examining the nurse-parent relationship. Contemp Nurse. Sep 1996;5(3):101-106. *Not eligible target population.*
2281. Rowen L, Raymond R, Thomas K. The patient care delivery mode at Mercy Medical Center: a licensed caregiver model. Aspens Advis Nurse Exec. Dec 1998;14(3):1, 3-6. *Not eligible exposure.*
2282. Rowland W. Patients' perceptions of nurse uniforms. Nurs Stand. Feb 2-8 1994;8(19):32-36. *Not eligible exposure.*
2283. Ruane-Morris M, Thompson G, Lawton S. Designing a nursing model for dermatology. Prof Nurse. Jun 1995;10(9):565-566. *Comment.*
2284. Rudy EB, Lucke JF, Whitman GR, Davidson LJ. Benchmarking patient outcomes. J Nurs Scholarsh. 2001;33(2):185-189. *Not eligible outcomes.*
2285. Rudy S, Sions J. Floating: managing a recruitment and retention issue. J Nurs Adm. Apr 2003;33(4):196-198. *No association tested.*
2286. Ruflin P, Matlack R, Holy C, Sorbello S, Nadzan L, Selden T. Closed-unit staffing speaks volumes. Nurs Manage. Jun 1999;30(6):37-39; quiz 40. *Comment.*
2287. Ruland CM, Ravn IH. Usefulness and effects on costs and staff management of a nursing resource management information system. Journal of nursing management May 2003;11(3):208-15. *Not relevant.*
2288. Runeson I, Hallstrom I, Elander G, Hermeren G. Children's participation in the decision-making process during hospitalization: an observational study. Nurs Ethics. Nov 2002;9(6):583-598. *Not eligible target population.*
2289. Runy LA. The health care workforce. State-by-state numbers and initiatives. Hosp Health Netw. Aug 2002;76(8):41-46. *Comment.*
2290. Rusch LM. Supporting clinical nursing leadership and professional practice at the unit level. Nurs Leadersh Forum. Winter 2004;9(2):61-66. *No association tested.*
2291. Rush J, Fiorino-Chiovitti R, Kaufman K, Mitchell A. A randomized controlled trial of a nursery ritual: wearing cover gowns to care for healthy newborns. Birth. Mar 1990;17(1):25-30. *Not eligible exposure*.
2292. Rushforth K. A randomised controlled trial of weaning from mechanical ventilation in paediatric intensive care (PIC). Methodological and practical issues. Intensive Crit Care Nurs. Apr 2005;21(2):76-86. *Not eligible target population.*
2293. Russell D. Changing public health nursing practice. Nurs N Z. Dec-2000 Jan 1999;5(11):18-19. *Comment.*
2294. Russell LJ, Reynolds TM. How accurate are pressure ulcer grades? An image-based survey of nurse performance. J Tissue Viability. Apr 2001;11(2):67, 70-65. *Not eligible target population.*
2295. Russell S. Reducing readmissions to the intensive care unit. Heart Lung. Sep-Oct 1999;28(5):365-372. *Not eligible target population.*
2296. Ruth M, Locsin R. The effect of music listening on acute confusion and delirium in elders undergoing elective hip and knee surgery. J Clin Nurs. Sep 2004;13(6B):91-96. *Not eligible exposure.*
2297. Ryan CA, Clark LM, Malone A, Ahmed S. The effect of a structured neonatal resuscitation program on delivery room practices. Neonatal Netw. Feb 1999;18(1):25-30. *Not eligible target population.*
2298. Ryan DW, Bayly PJ, Weldon OG, Jingree M. A prospective two-month audit of the lack of provision of a high-dependency unit and its impact on intensive care. Anaesthesia. Mar 1997;52(3):265-270. *Legal cases.*
2299. Ryan M. On the record. Nurs Stand. Mar 18-24 1998;12(26):23. *Comment.*
2300. Ryan M. A buddy program for international nurses. J Nurs Adm. Jun 2003;33(6):350-352. *News.*
2301. Ryan T, Hills B, Webb L. Nurse staffing levels and budgeted expenditure in acute mental health wards: a benchmarking study. J Psychiatr Ment Health Nurs. Feb 2004;11(1):73-81. *Not eligible target population.*
2302. Ryrie I, McGowan J. Staff perceptions of substance use among acute psychiatry inpatients. J Psychiatr Ment Health Nurs. Apr 1998;5(2):137-142. *Not eligible target population.*
2303. Sadaba JR, Wheatley GH. Surgical assistants and working time directives. Eur J Cardiothorac Surg. Jun 2004;25(6):1130-1131; author reply 1131-1132. *Comment.*

2304. Safdar N, Kluger DM, Maki DG. A review of risk factors for catheter-related bloodstream infection caused by percutaneously inserted, noncuffed central venous catheters: implications for preventive strategies. Medicine (Baltimore). Nov 2002;81(6):466-479. *Review.*
2305. Saigal S, Stoskopf BL, Feeny D, Furlong W, Burrows E, Rosenbaum PL, Hoult L. Differences in preferences for neonatal outcomes among health care professionals, parents, and adolescents. Jama. Jun 2 1999;281(21):1991-1997. *Not eligible exposure.*
2306. Salamon L, Lennon M. Decreasing companion usage without negatively affecting patient outcomes: a performance improvement project. MEDSURG Nursing Aug 2003;12(4):230-7. *Not relevant.*
2307. Sales A, Lurie N, Moscovice I, Goes J. Is quality in the eye of the beholder? Jt Comm J Qual Improv. May 1995;21(5):219-225. *Not eligible exposure.*
2308. Salluzzo RF, Bartfield JM, Freed H, Graber M, Peters T. Attitude of emergency department patients toward HIV-infected health care workers. Am J Emerg Med. Mar 1997;15(2):141-144. *Not eligible exposure.*
2309. Salt P, Clancy M. Implementation of the Ottawa Ankle Rules by nurses working in an accident and emergency department. J Accid Emerg Med. Nov 1997;14(6):363-365. *Not eligible target population.*
2310. Salvage D. Drug administration and professional accountability. Prof Nurse. Aug 1997;12(11):827. *Comment.*
2311. Salyer J. Environmental turbulence. Impact on nurse performance. J Nurs Adm. Apr 1995;25(4):12-20. *Not eligible exposure.*
2312. Sanchez-Sweatman L. The law, nurses and coffee breaks. Can Nurse. Dec 1995;91(11):39-40. *Legal cases.*
2313. Sandall J. Choice, continuity and control: changing midwifery, towards a sociological perspective. Midwifery. Dec 1995;11(4):201-209. *Not eligible target population.*
2314. Sanderson D. Research shows nursing agencies in a positive light. Br J Nurs. Jun 24-Jul 7 2004;13(12):690. *Not eligible target population.*
2315. Sandford DA, Elzinga RH, Iversen R. A quantitative study of nursing staff interactions in psychiatric wards. Acta Psychiatr Scand. Jan 1990;81(1):46-51. *Not eligible target population.*
2316. Sandiford R. 'I call it the rock and roll of nursing'. Nurs Times. Aug 3-9 2004;100(31):28-29. *Comment.*
2317. Sandlin D. Take a bite out of high employee turnover. J Perianesth Nurs. Apr 2001;16(2):109-111. *Comment.*
2318. Sanford K. Nurses, let's support each other more. Nursing. Jan 1990;20(1):109-118. *Not eligible exposure.*
2319. Santamaria N. The relationship between nurses' personality and stress levels reported when caring for interpersonally difficult patients. Aust J Adv Nurs. Dec-2001 Feb 2000;18(2):20-26. *Not eligible exposure.*
2320. Santamaria N, O'Sullivan S. Stress in perioperative nursing: sources, frequency and correlations to personality factors. Collegian. Jul 1998;5(3):10-15. *Not eligible target population.*
2321. Sanz C, Sunol R, Abello C, Blanc A. Design and results of the nursing quality assurance program in Hospital de la Santa Creu i Sant Pau: an integrated effort. Qual Assur Health Care. Sep 1993;5(3):267-273. *Not eligible target population.*
2322. Sartain SA, Clarke CL, Heyman R. Hearing the voices of children with chronic illness. J Adv Nurs. Oct 2000;32(4):913-921. *Not eligible target population.*
2323. Sasichay-Akkadechanunt T, Scalzi CC, Jawad AF. The relationship between nurse staffing and patient outcomes. J Nurs Adm. Sep 2003;33(9):478-485. *Not eligible target population.*
2324. Saver C. Nursing gets an "A". Nurs Spectr (Wash D C). Aug 11 1997;7(16):3. *Editorial.*
2325. Sawaki Y, Parker RK, White PF. Patient and nurse evaluation of patient-controlled analgesia delivery systems for postoperative pain management. J Pain Symptom Manage. Nov 1992;7(8):443-453. *Not eligible exposure.*
2326. Saxena AK, Panhotra BR. The impact of nurse understaffing on the transmission of hepatitis C virus in a hospital-based hemodialysis unit. Med Princ Pract. May-Jun 2004;13(3):129-135. *Not eligible target population.*
2327. Saxena AK, Panhotra BR, Sundaram DS, Naguib M, Venkateshappa CK, Uzzaman W, Mulhim KA. Impact of dedicated space, dialysis equipment, and nursing staff on the transmission of hepatitis C virus in a hemodialysis unit of the middle east. Am J Infect Control. Feb 2003;31(1):26-33. *Not eligible target population.*
2328. Sayers M, Marando R, Fisher S, Aquila A, Morrison B, Dailey T. No need for pain. J Healthc Qual. May-Jun 2000;22(3):10-15. *Not eligible exposure.*
2329. Scarbrough ML, Landis SE. A pilot study for the development of a hospital-based immunization program. Clin Nurse Spec. Mar 1997;11(2):70-75. *Not eligible exposure.*
2330. Schaffner A, Costa L, Propotnik T. Nurse sabbatical: reflections on professionalism. Nurs Manage. Sep 1992;23(9):118. *Comment.*
2331. Schaffner JW, Alleman S, Ludwig-Beymer P, Muzynski J, King DJ, Pacura LJ. Developing a patient care model for an integrated delivery system. J Nurs Adm. Sep 1999;29(9):43-50. *Review.*
2332. Schaffner M. Fighting fatigue. More than just a resident issue? Gastroenterol Nurs. Mar-Apr 2003;26(2):82-83. *Comment.*
2333. Scharer K. Nurse-parent relationship building in child psychiatric units. J Child Adolesc Psychiatr Nurs. Oct-Dec 1999;12(4):153-167. *Not eligible exposure.*
2334. Scharer K. Admission: a crucial point in relationship building between parents and staff in child psychiatric units. Issues Ment Health Nurs. Dec 2000;21(8):723-744. *Not eligible exposure.*

2335. Scharf L, Caley L. Patients', nurses', and physicians' perceptions of nurses' caring behaviors. Nursingconnections. Spring 1993;6(1):3-12. *Not eligible outcomes.*
2336. Scheerle PK. P. K. Scheerle. Interview by Marietta Lee. Am J Nurs. Jul 1994;94(7):38-40. *Interview.*
2337. Scherer YK, Haughey BP, Wu YW, Miller CM. A longitudinal study of nurses' attitudes toward caring for patients with AIDS in Erie County. J N Y State Nurses Assoc. Sep 1992;23(3):10-15. *Not eligible exposure.*
2338. Schildmeier D. Brockton nurses end 103-day strike. Contract includes staffing/mandatory OT protections. Revolution. Sep-Oct 2001;2(5):5. *News.*
2339. Schildmeier D. Massachusetts safe staffing: time runs out for bill this year but final hurdle on horizon. Revolution. Jul-Aug 2004;5(4):9. *News.*
2340. Schildmeier D. MNA blows whistle on hospitals using paramedics in RN roles. Revolution. Jan-Feb 2004;5(1):8-9. *Review.*
2341. Schmidt CE, Bottoni T. Improving medication safety and patient care in the emergency department. J Emerg Nurs. Feb 2003;29(1):12-16. *Comment.*
2342. Schmidt LA. Patients' perceptions of nurse staffing, nursing care, adverse events, and overall satisfaction with the hospital experience. Nurs Econ. Nov-Dec 2004;22(6):295-306, 291. *Not eligible exposure.*
2343. Schmieder RA, Smith CS. Moderating effects of social support in shiftworking and non-shiftworking nurses. Work & Stress Apr-Jun 1996;10(2):128-40. *Not relevant.*
2344. Schneider MP, Cotting J, Pannatier A. Evaluation of nurses' errors associated in the preparation and administration of medication in a pediatric intensive care unit. Pharm World Sci. Aug 1998;20(4):178-182. *Not eligible target population.*
2345. Schnelle JF, Simmons SF, Harrington C, et al. Relationship of nursing home staffing to quality of care. Health services research Apr 2004;39(2):225-50. *Nursing home.*
2346. Schoenfeld PS, Baker MD. Documentation in the pediatric emergency department: a review of resuscitation cases. Ann Emerg Med. Jun 1991;20(6):641-643. *Not eligible exposure.*
2347. Scholz DA. Establishing and monitoring an endemic medication error rate. J Nurs Qual Assur. Feb 1990;4(2):71-74. *Not eligible outcomes.*
2348. Scholz JA. Issue: how do you tell your patients that you are short-staffed? Ohio Nurses Rev. Feb 1997;72(2):16. *Comment.*
2349. Scholz JA. Issue: what guidelines does the Joint Commission on Accreditation of Healthcare Organizations use to determine if a hospital has adequate staffing for patient care? Ohio Nurses Rev. May 1998;73(5):16. *Comment.*
2350. Schraeder M, Friedman LH. Collective bargaining in the nursing profession: salient issues and recent developments in healthcare reform. Hosp Top. Summer 2002;80(3):21-24. *Review.*
2351. Schroder PJ, Washington WP. Administrative decision making: staff-patient ratios (a patient classification system for a psychiatric setting). Perspect Psychiatr Care. Jul-Sep 1982;20(3):111-123. *Not eligible year.*
2352. Schulmeister L. Chemotherapy medication errors: descriptions, severity, and contributing factors. Oncol Nurs Forum. Jul 1999;26(6):1033-1042. *Not eligible outcomes.*
2353. Schumacher KL. Reconceptualizing family caregiving: family-based illness care during chemotherapy. Res Nurs Health. Aug 1996;19(4):261-271. *Not eligible exposure.*
2354. Schwarz HO, Brodowy BA. Implementation and evaluation of an automated dispensing system. Am J Health Syst Pharm. Apr 15 1995;52(8):823-828. *Not eligible exposure.*
2355. Sciabarra C, Kronawetter N, Jacob M, Ruelo V, Falero Y, Quigley PA. Implementing practice innovations to improve nurse-client relationships. Rehabil Nurs. Mar-Apr 1999;24(2):51-54. *Not eligible outcomes.*
2356. Scott CA, Fish TR, Allen PJ. Design of an intensive epilepsy monitoring unit. Epilepsia. 2000;41 Suppl 5:S3-8. *Not eligible target population.*
2357. Scott LD, Hwang W, Rogers AE. The impact of multiple care giving roles on fatigue, stress, and work performance among hospital staff nurses. Journal of Nursing Administration Feb 2006;36(2):86-95. *Not relevant.*
2358. Scott H. Putting patient-centred care at the heart of nursing. Br J Nurs. Sep 9-22 2004;13(16):937. *Editorial.*
2359. Scott J. The closing down of a hospital is deeply traumatic for patients and staff. Nurs Times. Dec 1-7 1999;95(48):21. *Not eligible target population.*
2360. Scott RA. Multi-site coverage gives new meaning to "beyond the walls". Clin Nurse Spec. Mar 2000;14(2):51-53. *News.*
2361. Seaberg DC, MacLeod BA. Correlation between triage nurse and physician ordering of ED tests. Am J Emerg Med. Jan 1998;16(1):8-11. *Not eligible exposure.*
2362. Seago JA. Registered nurses, unlicensed assistive personnel, and organizational culture in hospitals. J Nurs Adm. May 2000;30(5):278-286. *Not eligible outcomes.*
2363. Seago JA. A comparison of two patient classification instruments in an acute care hospital. J Nurs Adm. May 2002;32(5):243-249. *Not eligible exposure.*
2364. Seccombe I. Right to nurse. Pay special: a bit excessive. Nurs Stand. Mar 8-14 1995;9(24):45. *Not eligible target population.*
2365. Sefton G, Farrell M, Noyes J. The perceived learning needs of paediatric intensive care nurses caring for children requiring haemofiltration. Intensive Crit Care Nurs. Feb 2001;17(1):40-50. *Not eligible target population.*
2366. Segesten K, Lundgren S, Lindstrom I. Versatility--consequence of changing from mixed to all registered nurse staffing on a surgical ward. J Nurs Manag. Jul 1998;6(4):223-230. *Not eligible target population.*

2365. Seigerst EG. East Liverpool City Hospital nurses make sweeping improvements. Ohio Nurses Rev. Aug 2000;75(7):15. *Not eligible target population.*
2366. Seigerst EG. Geneva negotiations. Ohio Nurses Rev. Feb 2000;75(2):12. *News.*
2367. Selbst SM, Fein JA, Osterhoudt K, Ho W. Medication errors in a pediatric emergency department. Pediatr Emerg Care. Feb 1999;15(1):1-4. *Not eligible exposure.*
2368. Selekman J, Snyder B. Nursing perceptions of using physical restraints on hospitalized children. Pediatr Nurs. Sep-Oct 1995;21(5):460-464. *Not eligible exposure.*
2369. Sella S, MacLeod JA. One year later: evaluating a changing delivery system. Nurs Forum. 1991;26(2):5-11. *Not eligible outcomes.*
2370. Sellick KJ, Russell S, Beckmann JL. Primary nursing: an evaluation of its effects on patient perception of care and staff satisfaction. International Journal of Nursing Studies (1983), 20, 265-273. Int J Nurs Stud. Jul 2003;40(5):545-551; discussion 553-544. *Not eligible target population.*
2371. Selvam A. The state of the health care workforce. Hosp Health Netw. Aug 2001;75(8):41, 43-46, 48. *Comment.*
2372. Seo Y, Ko J, Price JL. The determinants of job satisfaction among hospital nurses: a model estimation in Korea. Int J Nurs Stud. May 2004;41(4):437-446. *Not eligible target population.*
2373. Sermeus W, Hoy D, Jodrell N, Hyslop A, Gypen T, Kinnunen J, Mantas J, Delesie L, Tansley J, Hofdijk J. The WISECARE Project and the impact of information technology on nursing knowledge. Stud Health Technol Inform. 1997;46:176-181. *Not eligible target population.*
2374. Shader K, Broome ME, Broome CD, West ME, Nash M. Factors influencing satisfaction and anticipated turnover for nurses in an academic medical center. J Nurs Adm. Apr 2001;31(4):210-216. *Not eligible outcomes.*
2375. Shah A, De T. The effect of an educational intervention package about aggressive behaviour directed at the nursing staff on a continuing care psychogeriatric ward. Int J Geriatr Psychiatry. Jan 1998;13(1):35-40. *Not eligible exposure.*
2376. Shaha SH, Bush C. Fixing acuity: a professional approach to patient classification and staffing. Nurs Econ. Nov-Dec 1996;14(6):346-356. *No association tested.*
2377. Shahinpour N, Hollinger-Smith L, Perlia MA. The medical-psychiatric consultation liaison nurse. Meeting psychosocial needs of medical patients in the acute care setting. Nurs Clin North Am. Mar 1995;30(1):77-86. *Not eligible exposure.*
2378. Shamian J. Skill mix and clinical outcomes. Can Oper Room Nurs J. Jun 1998;16(2):36-41. *No association tested.*
2379. Shang E, Suchner U, Dormann A, Senkal M. Structure and organisation of 47 nutrition support teams in Germany: a prospective investigation in 2000 German hospitals in 1999. Eur J Clin Nutr. Oct 2003;57(10):1311-1316. *Not eligible target population.*
2380. Sharma T, Carson J, Berry C. Patient voices. Health Serv J. Jan 16 1992;102(5285):20-21. *Not eligible target population.*
2381. Sharu D. Attribution of blame for a child's disability. Prof Nurse. Sep 1996;11(12):790-792. *Not eligible target population.*
2382. Shattell M. Nurse bait: strategies hospitalized patients use to entice nurses within the context of the interpersonal relationship. Issues Ment Health Nurs. Feb-Mar 2005;26(2):205-223. *Not eligible exposure.*
2383. Shen HC, Cheng Y, Tsai PJ, Lee SH, Guo YL. Occupational stress in nurses in psychiatric institutions in Taiwan. J Occup Health. May 2005;47(3):218-225. *Not eligible target population.*
2384. Sherer JL. Next steps for nursing. Hosp Health Netw. Aug 20 1993;67(16):26-28. *Comment.*
2385. Sheward L, Hunt J, Hagen S, Macleod M, Ball J. The relationship between UK hospital nurse staffing and emotional exhaustion and job dissatisfaction. J Nurs Manag. Jan 2005;13(1):51-60. *Not eligible target population.*
2386. Shields L, Hunter J, Hall J. Parents' and staff's perceptions of parental needs during a child's admission to hospital: an English perspective. J Child Health Care. Mar 2004;8(1):9-33. *Not eligible target population.*
2387. Shields L, King S. Qualitative analysis of the care of children in hospital in four countries-Part 2. J Pediatr Nurs. Jun 2001;16(3):206-213. *Not eligible target population.*
2388. Shields L, Tanner A. Pilot study of a tool to investigate perceptions of family-centered care in different care settings. Pediatr Nurs. May-Jun 2004;30(3):189-197. *Not eligible target population.*
2389. Shih FJ, Liao YC, Chan SM, Duh BR, Gau ML. The impact of the 9-21 earthquake experiences of Taiwanese nurses as rescuers. Soc Sci Med. Aug 2002;55(4):659-672. *Not eligible target population.*
2390. Shindul-Rothschild J. Patient care. How good is it where you work? Am J Nurs. Mar 1996;96(3):22-24. *Comment.*
2391. Shindul-Rothschild J, Long-Middleton E, Berry D. 10 keys to quality care. Am J Nurs. Nov 1997;97(11):35-43. *No association tested.*
2392. Shinkman R. Hasta la vista for Calif. nursing ratios? Healthc Leadersh Manag Rep. Nov 2003;11(11):1, 7-11, 13. *Comment.*
2393. Shinkman R. Calif. hospitals move to comply with nurse ratios despite litigation. Healthc Leadersh Rep. Jan 2004;12(1):10-11. *News.*
2394. Shuldham CM. Commentary. Nursing skill mix and staffing. J Nurs Manag. Nov 2004;12(6):385-387. *Not eligible target population.*

2395. Shullanberger G. Nurse staffing decisions: an integrative review of the literature. Nursing Economics May-Jun 2000;18(3):124-32, 46-8. *Integrative review.*
2396. Shusterman C. How immigration laws affect hospitals. Hosp Top. Summer 1993;71(3):38-40. *Comment.*
2397. Sibbald B. Getting an early start on early discharge. Can Nurse. Mar 1997;93(3):18. *Comment.*
2398. Siders AM, Peterson M. Increasing patient satisfaction and nursing productivity through implementation of an automated nursing discharge summary. Proc Annu Symp Comput Appl Med Care. 1991:136-140. *Not eligible outcomes.*
2399. Silber JH, Williams SV, Krakauer H, Schwartz JS. Hospital and patient characteristics associated with death after surgery. A study of adverse occurrence and failure to rescue. Med Care. Jul 1992;30(7):615-629. *Not eligible exposure.*
2400. Silva N, Aderholdt B. Monitoring nursing productivity: a unique approach integrating an on-line kardex with workload measurement. Comput Nurs. Nov-Dec 1992;10(6):232-234. *Comment.*
2401. Silverman HJ, Tuma P, Schaeffer MH, Singh B. Implementation of the patient self-determination act in a hospital setting. An initial evaluation. Arch Intern Med. Mar 13 1995;155(5):502-510. *Not eligible exposure.*
2402. Silvestro R, Silvestro C. An evaluation of nurse rostering practices in the National Health Service. J Adv Nurs. Sep 2000;32(3):525-535. *Not eligible target population.*
2403. Simmer TL, Nerenz DR, Rutt WM, Newcomb CS, Benfer DW. A randomized, controlled trial of an attending staff service in general internal medicine. Med Care. Jul 1991;29(7 Suppl):JS31-40. *Not eligible exposure.*
2404. Simmons BL, Nelson DL. Eustress at work: the relationship between hope and health in hospital nurses. Health Care Manage Rev. Fall 2001;26(4):7-18. *Not eligible outcomes.*
2405. Simmons M. Implementation of a patient falls risk-management strategy. Prof Nurse. Nov 2001;17(3):168-171. *Not eligible target population.*
2406. Simon HK, McLario D, Daily R, Lanese C, Castillo J, Wright J. "Fast tracking" patients in an urban pediatric emergency department. Am J Emerg Med. May 1996;14(3):242-244. *Not eligible exposure.*
2407. Simons J, Roberson E. Poor communication and knowledge deficits: obstacles to effective management of children's postoperative pain. J Adv Nurs. Oct 2002;40(1):78-86. *Not eligible target population.*
2408. Simons JM, Macdonald LM. Pain assessment tools: children's nurses' views. J Child Health Care. Dec 2004;8(4):264-278. *Not eligible target population.*
2409. Simpson RG, Scothern G, Vincent M. Survey of carer satisfaction with the quality of care delivered to in-patients suffering from dementia. J Adv Nurs. Sep 1995;22(3):517-527. *Not eligible target population.*
2410. Simpson RL. IT takes a village. Improving health care in the 21st century. Nurs Adm Q. Apr-Jun 2003;27(2):180-183. *Review.*
2411. Simpson RL. In direct proportion: ratios, IT, and trust. Nurs Manage. Feb 2005;36(2):14-16. *Comment.*
2412. Sims CE. Increasing clinical, satisfaction, and financial performance through nurse-driven process improvement. J Nurs Adm. Feb 2003;33(2):68-75. *Not eligible exposure.*
2413. Sims L, Kippenbrock TA. Psychiatric nurses' satisfaction with a patient classification system for staffing. Issues Ment Health Nurs. Jul-Aug 1994;15(4):409-417. *Not eligible exposure.*
2414. Sinclair BP. Mandatory staffing ratios: a dilemma. AWHONN Lifelines. Apr-May 2002;6(2):91-92. *Editorial.*
2415. Sinclair K, Collins D, Potokar J. Drug misuse by patients in an inner-city hospital. Nurs Stand. Jun 25-Jul 1 2003;17(41):33-37. *Not eligible target population.*
2416. Sincox AK. Mandatory overtime can hurt a hospital's financial status. Mich Nurse. Nov 2004;77(9):9. *Comment.*
2417. Sincox AK, Harris E, Bissonnette T, Stevenson T. Safe patient care: a crisis in nursing. Mich Nurse. Aug 2004:4, 16. *Comment.*
2418. Siviter B, Scullion J, Jebb P, Humm C. Safety in numbers? Nurs Stand. Sep 25-Oct 1 2002;17(2):22. *Not eligible target population.*
2419. Skeie B, Mishra V, Vaaler S, Amlie E. A comparison of actual cost, DRG-based cost, and hospital reimbursement for liver transplant patients. Transpl Int. Oct 2002;15(9-10):439-445. *Not eligible target population.*
2420. Sklar J. Pain-less floating. Nurs Manage. Jul 1992;23(7):104. *Comment.*
2421. Slaughter J. Up against a giant. Nurses quash Tenet's demand for 16-hour shifts, win 'slam-dunk'. Revolution. May-Jun 2000;1(3):5. *News.*
2422. Slaughter J. Beyond outrage. Revolution. Jan-Feb 2000;1(1):28-35. *Comment.*
2423. Slomka J, Hoffman-Hogg L, Mion LC, Bair N, Bobek MB, Arroliga AC. Influence of clinicians' values and perceptions on use of clinical practice guidelines for sedation and neuromuscular blockade in patients receiving mechanical ventilation. Am J Crit Care. Nov 2000;9(6):412-418. *Not eligible exposure.*
2424. Slota MC, Balas-Stevens S. Implementing and evaluating a change to 12-hour shifts. Neonatal Netw. Jun 1990;8(6):51-56. *Not eligible outcomes.*
2425. Smedbold HT, Ahlen C, Unimed S, Nilsen AM, Norback D, Hilt B. Relationships between indoor environments and nasal inflammation in nursing personnel. Arch Environ Health. Mar-Apr 2002;57(2):155-161. *Not eligible target population.*
2426. Smedley J, Egger P, Cooper C, Coggon D. Prospective cohort study of predictors of incident low back pain in nurses. Bmj. Apr 26 1997;314(7089):1225-1228. *Not eligible target population.*

2427. Smedley J, Inskip H, Buckle P, Cooper C, Coggon D. Epidemiological differences between back pain of sudden and gradual onset. J Rheumatol. Mar 2005;32(3):528-532. *Not eligible target population.*
2428. Smedley J, Inskip H, Cooper C, Coggon D. Natural history of low back pain. A longitudinal study in nurses. Spine. Nov 15 1998;23(22):2422-2426. *Not eligible target population.*
2429. Smedley J, Inskip H, Trevelyan F, Buckle P, Cooper C, Coggon D. Risk factors for incident neck and shoulder pain in hospital nurses. Occup Environ Med. Nov 2003;60(11):864-869. *Not eligible target population.*
2430. Smedley J, Trevelyan F, Inskip H, Buckle P, Cooper C, Coggon D. Impact of ergonomic intervention on back pain among nurses. Scand J Work Environ Health. Apr 2003;29(2):117-123. *Not eligible target population.*
2431. Smeltzer CH. The Chicago plan: innovative strategies to change nurses' work patterns. J Nurs Adm. Sep 1990;20(9):3-5. *Editorial.*
2432. Smetzer JL. Lesson from Colorado. Beyond blaming individuals. Nurs Manage. Jun 1998;29(6):49-51. *Legal Cases.*
2433. Smith AM, Ortiguera SA, Laskowski ER, Hartman AD, Mullenbach DM, Gaines KA, Larson DR, Fisher W. A preliminary analysis of psychophysiological variables and nursing performance in situations of increasing criticality. Mayo Clin Proc. Mar 2001;76(3):275-284. *Not eligible exposure.*
2434. Smith AP. Saving nurses, saving patients: responses to the labor crisis. J Med Pract Manage. Jan-Feb 2004;19(4):193-197. *Review.*
2435. Smith DM, Gow P. Towards excellence in quality patient care: a clinical pathway for myocardial infarction. J Qual Clin Pract. Jun 1999;19(2):103-105. *Not eligible target population.*
2436. Smith DR, Ohmura K, Yamagata Z. Prevalence and correlates of hand dermatitis among nurses in a Japanese teaching hospital. J Epidemiol. May 2003;13(3):157-161. *Not eligible target population.*
2437. Smith F, Valentine F. Value added decisions. Paediatr Nurs. Sep 1999;11(7):9-10. *Not eligible target population.*
2438. Smith GB. Shifts in attitudes about self-esteem in the recovering chemically dependent nurse. Addictions Nursing Network Summer 1993;5(2):60-3. *Not peer reviewed.*
2439. Smith J, Crawford L. Medication errors and difficulty in first patient assignments of newly licensed nurses. JONAS Healthc Law Ethics Regul. Sep 2003;5(3):65-67. *Not eligible outcomes.*
2440. Smith J, Gamroth LM. The resident: the heart of it. Geriatr Nurs. May-Jun 1995;16(3):113-116. *Case Reports.*
2441. Smith K, Uphoff ME. Uncharted terrain: dilemmas born in the NICU grow up in the PICU. J Clin Ethics. Fall 2001;12(3):231-238. *Case Reports.*
2442. Smith LW, Mills JV. Psychometric evaluation of pharmacology calculation test for hospital staff nurses. J Healthc Educ Train. 1993;7(2):1-6. *Not eligible exposure.*
2443. Smith M, Doctor M, Boulter T. Unique considerations in caring for a pediatric burn patient: a developmental approach. Crit Care Nurs Clin North Am. Mar 2004;16(1):99-108. *Case reports.*
2444. Smith M, Specht J, Buckwalter KC. Geropsychiatric inpatient care: what is state of the art? Issues Ment Health Nurs. Jan 2005;26(1):11-22. *No association tested.*
2445. Smith MK, Janzen SK, Schaefer S, Hixon AK. Administrative support for addressing staff nurses' ethical concerns regarding staffing. J Nurs Adm. Mar 2001;31(3):103-104. *Letter.*
2446. Smith P. The effectiveness of a preceptorship model in postgraduate education for rural nurses. Aust J Rural Health. Aug 1997;5(3):147-152. *Not eligible target population.*
2447. Smith P, Adams D, Bersante S, Kalma S. Planning for patient care redesign: success through continuous quality improvement. J Nurs Care Qual. Jan 1994;8(2):73-80. *Comment.*
2448. Smith S. Understanding the experience of training for overseas nurses. Nurs Times. Oct 5-11 2004;100(40):40-42. *Not eligible target population.*
2449. Smith SA. RNs and UAPs: not much difference? Rn. Jul 1998;61(7):37-38. *Comment.*
2450. Smith SP. Nurses on the move. Saudi Arabia: land of adventure & opportunity. Revolution. Spring 1995;5(1):39-42. *Not eligible target population.*
2451. SmithBattle L, Diekemper M, Leander S. Getting your feet wet: becoming a public health nurse, part 1. Public Health Nursing Jan-Feb 2004;21(1):3-11. *Not relevant.*
2452. Sneed NV, Hollerbach AD. Accuracy of heart rate assessment in atrial fibrillation. Heart Lung. Sep-Oct 1992;21(5):427-433. *Case Reports.*
2453. Snow T. Too few to care. Nurs Stand. Sep 8-14 2004;18(52):12-13. *Comment.*
2454. Snowdon AW. Personal Construct Theory: a strategy for the study of multidimensional phenomena in nursing. Can J Nurs Res. Sep 2004;36(3):131-145. *Not eligible exposure.*
2455. Soar J, McKay U. A revised role for the hospital cardiac arrest team? Resuscitation. Sep 1998;38(3):145-149. *Not eligible target population.*
2456. Sobo EJ. Pediatric nurses may misjudge parent communication preferences. J Nurs Care Qual. Jul-Sep 2004;19(3):253-262. *Not eligible exposure.*
2457. Sochalski J, Estabrooks CA, Humphrey CK. Nurse staffing and patient outcomes: evolution of an international study. Can J Nurs Res. Dec 1999;31(3):69-88. *Review.*
2458. Soderberg A, Gilje F, Norberg A. Dignity in situations of ethical difficulty in intensive care. Intensive Crit Care Nurs. Jun 1997;13(3):135-144. *Not eligible target population.*
2459. Soliman F. Improving resource utilization through patient dependency systems. J Med Syst. Oct 1997;21(5):291-302. *Not eligible target population.*
2460. Soliman F. Patient Dependency Knowledge-Based Systems. J Med Syst. Oct 1998;22(5):357-370. *Not eligible target population.*

2461. Soliman F. Automation of patient dependency systems. J Med Syst. Aug 1998;22(4):225-236. N*ot eligible target population.*
2462. Soltani H, Dickinson F, Tanner J. Developing a maternity unit visiting policy. Pract Midwife. Oct 2004;7(9):27-30. *Not eligible exposure.*
2463. Somers A, Petrovic M, Robays H, Bogaert M. Reporting adverse drug reactions on a geriatric ward: a pilot project. Eur J Clin Pharmacol. Feb 2003;58(10):707-714. *Not eligible target population.*
2464 Sorrentino EA, Simunek LA. Nurses' perceptions of temporary nursing service agencies. Health Care Supervisor Apr 1991;9(3):55-62. *Inadequate data presentation.*
2465. Souder E, O'Sullivan P. Disruptive behaviors of older adults in an institutional setting. Staff time required to manage disruptions. J Gerontol Nurs. Aug 2003;29(8):31-36. *Not eligible target population.*
2466. Souhrada L. Bumpy junction may lie between supplies and nursing models. Mater Manag Health Care. Jun 1995;4(6):34, 36, 38. *Comment.*
2467. Sourial R, McCusker J, Cole M, Abrahamowicz M. Agitation in demented patients in an acute care hospital: prevalence, disruptiveness, and staff burden. Int Psychogeriatr. Jun 2001;13(2):183-197. *Not eligible target population.*
2468. Southard-Ritter M. Patient-focused care: what it is--what it is not. Pa Nurse. May 1995;50(5):6-7. *Comment.*
2469. Spangler Z. Culture care of Philippine and Anglo-American nurses in a hospital context. Culture care diversity and universality: a theory of nursing National League for Nursing 1991(Leininger MM):119-46. (57 ref) (Pamhet #15-2402). *Not relevant.*
2470. Spangler Z. Transcultural care values and nursing practices of Philippine-American nurses. Journal of Transcultural Nursing Winter 1992;3(2):28-37. *Not relevant.*
2471. Speas J. A shift in staff relationships. Holist Nurs Pract. Sep-Oct 2004;18(5):235-237. *Review.*
2472. Spetz J. Public policy and nurse staffing: what approach is best? J Nurs Adm. Jan 2005;35(1):14-16. *Review.*
2473. Spetz J, Adams S. How can employment-based benefits help the nurse shortage? Health Aff (Millwood). Jan-Feb 2006;25(1):212-218. *No association tested.*
2474. Spiegel R, Brunner C, Ermini-Funfschilling D, Monsch A, Notter M, Puxty J, Tremmel L. A new behavioral assessment scale for geriatric out- and in-patients: the NOSGER (Nurses' Observation Scale for Geriatric Patients). J Am Geriatr Soc. Apr 1991;39(4):339-347. *Not eligible target population.*
2475. Spiegel T. Flexible sigmoidoscopy training for nurses. Gastroenterol Nurs. Nov-Dec 1995;18(6):206-209. *Not eligible exposure.*
2476. Spilsbury K, Meyer J. Use, misuse and non-use of health care assistants: understanding the work of health care assistants in a hospital setting. J Nurs Manag. Nov 2004;12(6):411-418. *Not eligible target population.*
2477. Sproat LJ, Inglis TJ. A multicentre survey of hand hygiene practice in intensive care units. J Hosp Infect. Feb 1994;26(2):137-148. *Not eligible target population.*
2478. Squires A. New graduate orientation in the rural community hospital. Journal of continuing education in nursing Sep-Oct 2002;33(5):203-9. *Not relevant.*
2479. Stabenow D. A prescription for addressing Michigan's nursing shortage. Mich Nurse. Sep 2005;78(7):11. *Comment.*
2480. Stacchini J. Does your staffing agency have JCAHO's stamp of approval? Nurs Manage. Apr 2005;36(4):65-67. *Review.*
2481. Stahl M. What makes the ideal dialysis setting? Nephrol News Issues. Oct 1998;12(10):39-40. *Comment.*
2482. Stamouli MA, Mantas J. Development and evaluation of a nursing service management and administration information system at district hospital. Medinfo. 2001;10(Pt 1):759-763. *Not eligible target population.*
2483. Standing T, Anthony MK, Hertz JE. Nurses' narratives of outcomes after delegation to unlicensed assistive personnel. Outcomes Manag Nurs Pract. Jan-Mar 2001;5(1):18-23. *Not eligible exposure.*
2484. Stanford D. Who is accountable for inadequate staffing? Nurs N Z. Sep 2001;7(8):4. *Letter.*
2485. Stannard D. The Synergy Model in practice. Being a good dance partner. Crit Care Nurse. Dec 1999;19(6):86-87. *Case Reports.*
2486. Staring SL. Addressing the educational needs of shiftworkers: should shift be a consideration? J Contin Educ Nurs. Mar-Apr 1995;26(2):79-83. *Not eligible outcomes.*
2487. Stead L. Practice makes perfect. Nurs Times. Jan 20-26 2000;96(3):41. *Comment.*
2488. Stearley HE. Stat nursing--alive and well. Nurs Econ. Mar-Apr 1994;12(2):96-99, 105. *Comment.*
2489. Stechmiller JK, Yarandi HN. Job satisfaction among critical care nurses. Am J Crit Care. Nov 1992;1(3):37-44. *Not eligible outcomes.*
2490. Stechmiller JK, Yarandi HN. Predictors of burnout in critical care nurses. Heart Lung. Nov-Dec 1993;22(6):534-541. *Not eligible outcomes.*
2491. Steele D. Mother country. Nurs Stand. Jul 1-7 1998;12(41):24-25. *Comment.*
2492. Steele L. Shifting patterns. Nurs Stand. Nov 20 1996;11(9):14. *Comment.*
2493. Steenkamp WC, van der Merwe AE. The psychosocial functioning of nurses in a burn unit. Burns. May 1998;24(3):253-258. *Not eligible exposure.*
2494. Steinbrook R. Nursing in the crossfire. N Engl J Med. May 30 2002;346(22):1757-1766. *Comment.*
2495. Steinhauser KE, Maddox GL, Person JL, Tulsky JA. The evolution of volunteerism and professional staff within hospice care in North Carolina. Hosp J. 2000;15(1):35-51. *Not eligible target population.*
2496. Stelling J. But is it nursing? Nurs Que. Jul-Aug 1991;11(4):25-30, 64-29. *No association tested.*

2497. Stelling J, Milne-Smith J. Breakpoints and continuities: a case study of reactive change. Nurs Adm Q. Spring 1994;18(3):43-50. *No association tested.*
2498. Stephen H. Yellow card for violent patients. Nurs Stand. Sep 16-22 1998;12(52):14. *News.*
2499. Stewart M. New nursing shortage hits; causes complex. Am Nurse. Mar-Apr 1998;30(2):32. *Comment.*
2500. Stimler C. A pressure ulcer toolbox for facilitating hospital-wide quality. Adv Wound Care. May-Jun 1998;11(3 Suppl):13. *Comment.*
2501. Stodart K. Flash point in Nelson. N Z Nurs J. Jul 1990;83(6):16-18. *Not eligible target population.*
2502. Stolman CJ, Gregory JJ, Dunn D, Levine JL. Evaluation of patient, physician, nurse, and family attitudes toward do not resuscitate orders. Arch Intern Med. Mar 1990;150(3):653-658. *Not eligible outcomes.*
2503. Stopfkuchen H. Impact of national health system financing on quality of care in the intensive care unit: the German experience. Crit Care Med. Sep 1993;21(9 Suppl):S406-407. *Not eligible target population.*
2504. Stotka JL, Wong ES, Williams DS, Stuart CG, Markowitz SM. An analysis of blood and body fluid exposures sustained by house officers, medical students, and nursing personnel on acute-care general medical wards: a prospective study. Infect Control Hosp Epidemiol. Oct 1991;12(10):583-590. *Not eligible exposure.*
2505. Stratton KM, Blegen MA, Pepper G, Vaughn T. Reporting of medication errors by pediatric nurses. J Pediatr Nurs. Dec 2004;19(6):385-392. *Not eligible outcomes.*
2506. Street A, Cuddihy L, Best D, Wilks D, Geladas D, Chew S. Rostering: placing the nurse in the picture. Contemp Nurse. Dec 1997;6(3-4):145-151. *Not eligible target population.*
2507. Street K, Ashcroft R, Henderson J, Campbell AV. The decision making process regarding the withdrawal or withholding of potential life-saving treatments in a children's hospital. J Med Ethics. Oct 2000;26(5):346-352. *Not eligible target population.*
2508. Strzalka A, Havens DS. Nursing care quality: comparison of unit-hired, hospital float pool, and agency nurses. J Nurs Care Qual. Jul 1996;10(4):59-65. *Not eligible exposure.*
2509. Stumpf LR. A comparison of governance types and patient satisfaction outcomes. J Nurs Adm. Apr 2001;31(4):196-202. *Not eligible association presentation.*
2510. Sugrue NM. Public policy initiatives and the nursing shortage: a disconnect. J Nurs Adm. Jan 2005;35(1):19-22. *Review.*
2511. Suhonen R, Valimaki M, Leino-Kilpi H, Katajisto J. Testing the individualized care model. Scand J Caring Sci. Mar 2004;18(1):27-36. *Not eligible target population.*
2512. Sujijantararat R, Booth RZ, Davis LL. Nosocomial urinary tract infection: nursing-sensitive quality indicator in a Thai hospital. J Nurs Care Qual. Apr-Jun 2005;20(2):134-139. *Not eligible target population.*
2513. Sullivan J, Howland-Gradman J, Schell M, Goldsmith J. Reducing costs and improving processes for the interventional cardiology patient. J Cardiovasc Nurs. Jan 1997;11(2):22-36. *Not eligible exposure.*
2514. Sullivan RJ, Menapace LW, White RM. Truth-telling and patient diagnoses. J Med Ethics. Jun 2001;27(3):192-197. *Not eligible outcomes.*
2515. Suominen T, Leino-Kilpi H, Laippala P. Nurses' role in informing breast cancer patients: a comparison between patients' and nurses' opinions. J Adv Nurs. Jan 1994;19(1):6-11. *Not eligible target population.*
2516. Suominen T, Leino-Kilpi H, Merja M, Doran DI, Puukka P. Staff empowerment in Finnish intensive care units. Intensive Crit Care Nurs. Dec 2001;17(6):341-347. *Not eligible target population.*
2517. Sutherland K, Morgan J, Semple S. Self-administration. QMC study methodology. Nurs Times. Jun 7-13 1995;91(23):30-31. *Comment.*
2518. Sutherland K, Morgan J, Semple S. Self-administration. Education and accountability. Nurs Times. Jun 7-13 1995;91(23):32-33. *Comment.*
2519. Sutton J, Standen P, Wallace A. Incidence and documentation of patient accidents in hospital. Nurs Times. Aug 17-23 1994;90(33):29-35. *Not eligible target population.*
2520. Svenson J, Besinger B, Stapczynski JS. Critical care of medical and surgical patients in the ED: length of stay and initiation of intensive care procedures. Am J Emerg Med. Nov 1997;15(7):654-657. *Not eligible exposure.*
2521. Swain S. Serving suggestions. The ward sister's view. Nurs Times. Aug 12-18 1998;94(32):27. *Not eligible target population.*
2522. Sweeney YT, Whitaker C. Successful change: renaissance without revolution. Semin Nurse Manag. Dec 1994;2(4):196-202. *Not eligible exposure.*
2523. Sznajder M, Leleu G, Buonamico G, Auvert B, Aegerter P, Merliere Y, Dutheil M, Guidet B, Le Gall JR. Estimation of direct cost and resource allocation in intensive care: correlation with Omega system. Intensive Care Med. Jun 1998;24(6):582-589. *Not eligible target population.*
2524. Tabet N, Hudson S, Sweeney V, Sauer J, Bryant C, Macdonald A, Howard R. An educational intervention can prevent delirium on acute medical wards. Age Ageing. Mar 2005;34(2):152-156. *Not eligible target population.*
2525. Tabone S. Unsung nursing heroes. Tex Nurs. Jun-Jul 1997;71(6):7. *Comment.*
2526. Tabone S. Don't get mad--get help. Tex Nurs. Feb 1997;71(2):11. *Comment.*
2527. Tabone S. Staff models for the next millennium. Tex Nurs. May 1999;73(5):6-7, 10. *Comment.*
2528. Tabone S. Staff nurse participation is key. Tex Nurs. Mar 2001;75(3):7, 10. *Comment.*
2529. Tabone S. Nurse fatigue: the human factor. Tex Nurs. Jun-Jul 2004;78(5):8-10. *Review.*

2530. Tahan HA. Essentials of advocacy in case management. Lippincotts Case Manag. May-Jun 2005;10(3):136-145; quiz 146-137. *Review.*
2531. Takenouchi J. When no news isn't good news. How hospital ties with a newspaper put a story on the spike. Revolution. Sep-Oct 2001;2(5):18-19. *Comment.*
2532. Tamblyn S. High risk nursing in Los Angeles. Aust Nurses J. Feb 1990;19(7):18-20. *Comment.*
2533. Tamburri LM, DiBrienza R, Zozula R, Redeker NS. Nocturnal care interactions with patients in critical care units. Am J Crit Care. Mar 2004;13(2):102-112; quiz 114-105. *Not eligible exposure.*
2534. Tammelleo AD. Legal case briefs for nurses. IL: failure to diagnose pt.'s TB: attending nurse sues: N.H.: the school nurse: a professional engaged in teaching? Regan Rep Nurs Law. Mar 1991;31(10):3. *Case Reports.*
2535. Tammelleo AD. Mystery nurse reports child's sexually transmitted disease in error. Case in point: Perez v. Bay Area Hospital (829 P. Rptr. 2d 700--OR [1992]). Regan Rep Nurs Law. Jul 1992;33(2):4. *Case Reports.*
2536. Tammelleo AD. Legal case briefs for nurses. IL.: "medication dosage misadventure" triggers libel suit: privileged communication; IL.: spinal meningitis misdiagnosed: "patient dumping" charged. Regan Rep Nurs Law. Feb 1992;32(9):3. *Case Reports.*
2537. Tammelleo AD. Court upholds nurse's refusal to float. Case in point: Winkleman v. Beloit Memorial Hosp. (483 N.W. 2d 211--WI [1992]). Regan Rep Nurs Law. Jul 1992;33(2):2. *Legal Cases.*
2538. Tammelleo AD. Nurse denied pay differential for unscheduled work. Regan Rep Nurs Law. Jun 1992;33(1):1. *Legal Cases.*
2539. Tammelleo AD. Care allegedly provided without proper supervision. Case in point: Raicevich v. Plum Creek Medical P.C. 918 F. Supp. 2d 929--CO (1993). Regan Rep Nurs Law. Nov 1993;34(6):4. *Case Reports.*
2540. Tammelleo AD. Failure to follow orders: patient arrests--coma results. Case in point: Sullivan v. Sumrall By Ritchley 618 So. 2d 1274--MS (1993). Regan Rep Nurs Law. Aug 1993;34(3):4. *Case Reports.*
2541. Tammelleo AD. Legal case briefs for nurses. OK: Slip and fall of "medicated" patient: nurse abandons patient in shower. NY: Failure to diagnose fetal distress: suit for prolongation of distress. Regan Rep Nurs Law. May 1993;33(12):3. *Case Reports.*
2542. Tammelleo AD. Death after E.R. treatment: proximate cause issue. Case in point: Godeaux v. Rayne Branch Hosp. (606 So. 2d 948--LA [1992]). Regan Rep Nurs Law. Feb 1993;33(9):4. *Case Reports.*
2543. Tammelleo AD. Legal case briefs for nurses. IA: unattended pt. falls in bathroom: "routine nonmedicale care" standard applied; OR: nurses state "all sponges ... removed": court rejects "captain of ship" doctrine. Regan Rep Nurs Law. Nov 1993;34(6):3. *Case Reports.*
2544. Tammelleo AD. Legal case briefs for nurses. NY: refusal to stay for additional shift: "abandonment" charged--suspension results. AL: substance abuse--licence revocation: highly qualified and talented nurse. Regan Rep Nurs Law. Mar 1993;33(10):3. *Case Reports.*
2545. Tammelleo AD. Legal case briefs for nurses. GA: "non-life-threatening" assessment: four hour delay--patient leaves E.R. and dies; LA: nurse gives I.M. instead of I.V.: pharmacy failure to give directions. Regan Rep Nurs Law. May 1994;34(12):3. *Case Reports.*
2546. Tammelleo AD. Legal case briefs for nurses. NY: overworked nurse falls asleep at wheel: auto accident--workers' comp. issue; NY: working outside of job description: union contract and civil service violations. Regan Rep Nurs Law. Jul 1994;35(2):3. *Legal Cases.*
2547. Tammelleo AD. Failure to follow protocols: hospital vulnerability. Case in point: Romo v. Union Memorial Hospital, Inc. 878 F. Supp. 837--NC (1995). Regan Rep Nurs Law. May 1995;35(12):2. *Case Reports.*
2548. Tammelleo AD. OH: "LifeFlight" nurse & pilot to marry: hospital's nepotism policy mandates transfer. Regan Rep Nurs Law. Sep 1995;36(4):3. *Legal Cases.*
2549. Tammelleo AD. Arbitrator's award of E.R. job to existing employee upheld. Regan Rep Nurs Law. Sep 1995;36(4):2. *Legal Cases.*
2550. Tammelleo AD. Nurse risk manager alleges "retaliatory transfer". Regan Rep Nurs Law. Sep 1995;36(4):1. *Legal Cases.*
2551. Tammelleo AD. FL: did physician prescribe excess dosage?: did nurse err in administering meds.? Regan Rep Nurs Law. Dec 1997;38(7):3. *Legal Cases.*
2552. Tammelleo AD. Refusal to be party to 'trumped-up' charges--retaliatory termination. Case on point: Gerard v. Camden Cnty. Health Srvcs. Ctr., N.J. Supr.App.Div. 3/6/2002-NJ. Nurs Law Regan Rep. Mar 2002;42(10):4. *Legal Cases.*
2553. Tan SG, Lim SH, Malathi I. Does routine gowning reduce nosocomial infection and mortality rates in a neonatal nursery? A Singapore experience. Int J Nurs Pract. Nov 1995;1(1):52-58. *Not eligible target population.*
2554. Tanabe P, Gimbel R, Yarnold PR, Kyriacou DN, Adams JG. Reliability and validity of scores on The Emergency Severity Index version 3. Acad Emerg Med. Jan 2004;11(1):59-65. *Not eligible exposure.*
2555. Tanner CA. Living in the midst of a paradigm shift. J Nurs Educ. Feb 1995;34(2):51-52. *Editorial.*
2556. Tarnow-Mordi WO, Hau C, Warden A, Shearer AJ. Hospital mortality in relation to staff workload: a 4-year study in an adult intensive-care unit. Lancet. Jul 15 2000;356(9225):185-189. *Not eligible target population.*
2557. Tate ET, Lund CH, Smart R. A Flex-Ability Nurse (FAN) program. Nurs Manage. May 1998;29(5):46. *Comment.*
2558. Tattam A. The sun the moon & the stars. Aust Nurs J. Mar 1995;2(8):21-22. *Comment.*

2559. Taunton RL, Kleinbeck SVM, Stafford R, et al. Patient outcomes: are they linked to registered nurse absenteeism, separation, or work load? Journal of Nursing Administration Apr 1994;24(4S): Suppl):48-55. *Not relevant; patient outcomes.*
2560. Taxis K, Barber N. Ethnographic study of incidence and severity of intravenous drug errors. Bmj. Mar 29 2003;326(7391):684. *Not eligible target population.*
2561. Taxis K, Barber N. Incidence and severity of intravenous drug errors in a German hospital. Eur J Clin Pharmacol. Jan 2004;59(11):815-817. *Not eligible target population.*
2562. Taylor C, Gardner B, Heslop L, Lowe E, Habner M, Athan D. Identification of factors contributing to increased length of stay in two diagnosis related groups. Aust Health Rev. 2001;24(4):81-90. *Not eligible target population.*
2564. Taylor C, Ogle KR, Olivieri D, English R, Dennis M. Taking on the student role: how can we improve the experience of registered nurses returning to study? Aust Crit Care. Sep 1999;12(3):98-102. *Not eligible target population.*
2565. Taylor CB, Houston-Miller N, Killen JD, DeBusk RF. Smoking cessation after acute myocardial infarction: effects of a nurse-managed intervention. Ann Intern Med. Jul 15 1990;113(2):118-123. *Not eligible exposure.*
2566. Taylor JA, Brownstein D, Christakis DA, Blackburn S, Strandjord TP, Klein EJ, Shafii J. Use of incident reports by physicians and nurses to document medical errors in pediatric patients. Pediatrics. Sep 2004;114(3):729-735. *Not eligible exposure.*
2567. Taylor M, Keighron K. Healing is who we are ... and who are we? Nurs Adm Q. Oct-Dec 2004;28(4):241-248. *Comment.*
2568. Taylor ME. SWAT team: aggressive approach to the '90s. Nurs Econ. Nov-Dec 1991;9(6):431-433. *Not eligible outcomes.*
2569. Taylor NT. The Magnetic pull. Nurs Manage. Jan 2004;35(1):38-44. *Review.*
2570. Teahan B. Implementation of a self-scheduling system: a solution to more than just schedules! J Nurs Manag. Nov 1998;6(6):361-368. *Not eligible target population.*
2571. Ter Maat M. An appropriate nursing skill mix: survey of acuity systems in rehabilitation hospitals. Rehabil Nurs. Jul-Aug 1993;18(4):244-248. *No association tested.*
2572. Teresi JA, Grant LA, Holmes D, Ory MG. Staffing in traditional and special dementia care units. Preliminary findings from the National Institute on Aging Collaborative Studies. J Gerontol Nurs. Jan 1998;24(1):49-53. *Review.*
2573. Terris J, Leman P, O'Connor N, Wood R. Making an IMPACT on emergency department flow: improving patient processing assisted by consultant at triage. Emerg Med J. Sep 2004;21(5):537-541. *Not eligible target population.*
2574. Thanasa G, Afthentopoulos IE. The patient with diabetic nephropathy in the hospital. Edtna Erca J. Oct-Dec 1999;25(4):28-31. *Not eligible target population.*
2575. Theelen B, Rorive G, Krzesinski JM, Collart F. Belgian peer review experience on the Achille's Heel in haemodialysis care: vascular access. Edtna Erca J. Oct-Dec 2002;28(4):164-166. *Not eligible target population.*
2576. Thomas EJ, Sexton JB, Helmreich RL. Discrepant attitudes about teamwork among critical care nurses and physicians. Crit Care Med. Mar 2003;31(3):956-959. *Not eligible exposure.*
2577. Thomas L. Attractive force of nursing. Nurs Stand. Mar 8-14 2000;14(25):3. *Editorial.*
2578. Thomas LH. A comparison of the verbal interactions of qualified nurses and nursing auxiliaries in primary, team and functional nursing wards. Int J Nurs Stud. Jun 1994;31(3):231-244. *Not eligible exposure.*
2579. Thomas MB. Study examines working hours and feelings of fatigue by reported nurses. Texas Board of Nursing Bulletin Oct 2005;36(4):2-3. *Not peer reviewed.*
2580. Thomas N. Pain control: patient and staff perceptions of PCA. Nurs Stand. Mar 31-Apr 6 1993;7(28):37-39. *Not eligible target population.*
2581. Thompson CR. When your patient doesn't want to leave. Am J Nurs. Mar 1998;98(3):40-41. *Comment.*
2582. Thompson DG. Critical pathways in the intensive care & intermediate care nurseries. MCN Am J Matern Child Nurs. Jan-Feb 1994;19(1):29-32. *Not eligible exposure.*
2583. Thompson DM, Kozak SE, Sheps S. Insulin adjustment by a diabetes nurse educator improves glucose control in insulin-requiring diabetic patients: a randomized trial. Cmaj. Oct 19 1999;161(8):959-962. *Not eligible exposure.*
2584. Thompson DN, Wolf GA, Spear SJ. Driving improvement in patient care: lessons from Toyota. J Nurs Adm. Nov 2003;33(11):585-595. *Not eligible target population.*
2585. Thompson J, Irvine T, Grathwohl K, Roth B. Misuse of metered-dose inhalers in hospitalized patients. Chest. Mar 1994;105(3):715-717. *Not eligible exposure.*
2586. Thompson K, Melby V, Parahoo K, Ridley T, Humphreys WG. Information provided to patients undergoing gastroscopy procedures. J Clin Nurs. Nov 2003;12(6):899-911. *Not eligible target population.*
2587. Thompson S. After the volcano. Interview by Lynne Wallis. Nurs Stand. Sep 8-14 2004;18(52):20-21. *Interview.*
2588. Thompson TM. Can medical error self-reporting be easily implemented? Counterpoint. Nurs Leadersh Forum. Fall 2001;6(1):5-8. *Not eligible outcomes.*
2589. Thompson W. Don't scapegoat temporary nurses. Nurs Stand. Jan 15 1997;11(17):16. *News.*
2590. Thomson D. Outcomes of hospital staffing research project: a preliminary report. Concern. Feb 1999;28(1):9. *Comment.*
2591. Thomson PJ. Cancelled operations. A current problem in oral and maxillofacial surgery. Br Dent J. Oct 19 1991;171(8):244-245. *Not eligible exposure.*

2592. Thornton L. The Model of Whole-Person Caring: creating and sustaining a healing environment. Holist Nurs Pract. May-Jun 2005;19(3):106-115. *Not eligible exposure.*
2593. Thrall TH. Workforce. Tightening ratios. Hosp Health Netw. Jan 2004;78(1):24, 26. *News.*
2594. Thrall TH. Workforce. Creative recruiting in southern Ohio. Cincinnati-area hospitals get serious--and a little silly--to cut nurse vacancy rate. Hosp Health Netw. Apr 2005;79(4):20, 22. *News.*
2595. Thurston J, Field S. Should accident and emergency nurses request radiographs? Results of a multicentre evaluation. J Accid Emerg Med. Mar 1996;13(2):86-89. *Not eligible exposure.*
2596. Thurtle V. Why do nurses enter community and public health practice? Community Pract. Apr 2005;78(4):140-145. *Not eligible target population.*
2597. Thyer GL. Dare to be different: transformational leadership may hold the key to reducing the nursing shortage. J Nurs Manag. Mar 2003;11(2):73-79. *Not eligible target population.*
2598. Tibby SM, Correa-West J, Durward A, Ferguson L, Murdoch IA. Adverse events in a paediatric intensive care unit: relationship to workload, skill mix and staff supervision. Intensive Care Med. Jun 2004;30(6):1160-1166. *Not eligible target population.*
2599. Tieman J. Registered nurses key to good patient outcomes, study finds. But national nursing groups disagree over ratio laws and how best to recruit and retain quality nurses. Mod Healthc. Jun 3 2002;32(22):10-11. *News.*
2600. Tieman J. Nursing the nurse shortage. As feds collaborate, states and localities act on own. Mod Healthc. May 20 2002;32(20):20-21. *News.*
2601. Tieman J. Double standards. Amid push for nurse ratio laws, the nation's hospitals also face new JCAHO requirements for measuring staffing effectiveness. Mod Healthc. Apr 8 2002;32(14):30-32. *Review.*
2602. Tien SF. Nurses' knowledge of traditional Chinese postpartum customs. West J Nurs Res. Nov 2004;26(7):722-732. *Not eligible target population.*
2603. Tierney AJ, Taylor J. Research in practice: an 'experiment' in researcher-practitioner collaboration. J Adv Nurs. May 1991;16(5):506-510. *Not eligible target population.*
2604. Tierney MJ, Lavelle M. An investigation into modification of personality hardiness in staff nurses. J Nurs Staff Dev. Jul-Aug 1997;13(4):212-217. *Not eligible exposure.*
2605. Tigert JA, Laschinger HK. Critical care nurses' perceptions of workplace empowerment, magnet hospital traits and mental health. Dynamics. Winter 2004;15(4):19-23. *Not eligible exposure.*
2606. Tillman HJ, Salyer J, Corley MC, Mark BA. Environmental turbulence: staff nurse perspectives. J Nurs Adm. Nov 1997;27(11):15-22. *No association tested.*
2607. Timmins F, Kaliszer M. Information needs of myocardial infarction patients. Eur J Cardiovasc Nurs. Apr 2003;2(1):57-65. *Not eligible target population.*
2608. Timmons S, Tanner J. Operating theatre nurses: emotional labour and the hostess role. Int J Nurs Pract. Apr 2005;11(2):85-91. *Not eligible target population.*
2609. Tippett J. Nurses' acquisition and retention of knowledge after trauma training. Accid Emerg Nurs. Jan 2004;12(1):39-46. *Not eligible target population.*
2610. Titone NJ, Cross R, Sileo M, Martin G. Taking family-centered care to a higher level on the heart and kidney unit. Pediatr Nurs. Nov-Dec 2004;30(6):495-497. *Not eligible exposure.*
2611. Todd C, Robinson G, Reid N. 12-hour shifts: job satisfaction of nurses. J Nurs Manag. Sep 1993;1(5):215-220. *Not eligible target population.*
2612. Todd V, Van Rosendaal G, Duregon K, Verhoef M. Percutaneous endoscopic gastrostomy (PEG): the role and perspective of nurses. J Clin Nurs. Feb 2005;14(2):187-194. *Not eligible exposure.*
2613. Tokarski C. Government eases up on foreign nurses. Mod Healthc. Dec 10 1990;20(49):2. *News.*
2614. Tomlinson PS, Kirschbaum M, Tomczyk B, Peterson J. The relationship of child acuity, maternal responses, nurse attitudes and contextual factors in the bone marrow transplant unit. Am J Crit Care. May 1993;2(3):246-252. *Not eligible outcomes.*
2615. Tomlinson PS, Swiggum P, Harbaugh BL. Identification of nurse-family intervention sites to decrease health-related family boundary ambiguity in PICU. Issues Compr Pediatr Nurs. Jan-Mar 1999;22(1):27-47. *Not eligible exposure.*
2616. Tonges MC. Job design for nurse case managers. Intended and unintended effects on satisfaction and well-being. Nurs Case Manag. Jan-Feb 1998;3(1):11-23; quiz 24-15. *Not eligible exposure.*
2617. Tonges MC, Baloga-Altieri B, Atzori M. Amplifying nursing's voice through a staff-management partnership. J Nurs Adm. Mar 2004;34(3):134-139. *Review.*
2618. Tonuma M, Winbolt M. From rituals to reason: creating an environment that allows nurses to nurse. Int J Nurs Pract. Aug 2000;6(4):214-218. *Not eligible target population.*
2619. Torkelson DJ, Dobal MT. Constant observation in medical-surgical settings: a multihospital study. Nurs Econ. May-Jun 1999;17(3):149-155. *Not eligible exposure.*
2620. Tornabeni J. Care 2000--a patient-focused care model. Calif Hosp. Jul-Aug 1994;8(4):12-13. *Comment.*
2621. Tourangeau AE, White P, Scott J, McAllister M, Giles L. Evaluation of a partnership model of care delivery involving registered nurses and unlicensed assistive personnel. Can J Nurs Leadersh. May-Jun 1999;12(2):4-20. *Not eligible exposure.*
2622. Toyry E, Herve R, Mutka R, Savolainen P, Seppanen M. Ethics in health care management: developing an instrument to assess humane caring. Nurs Ethics. May 1998;5(3):228-235. *Not eligible target population.*
2623. Trafford A. The nursing shortage--a Washington Post columnist's perspective. Interview by Iris C. Frank. J Emerg Nurs. Aug 2001;27(4):391-393. *Interview.*

2624. Trammell TR, Fisher D, Brueckmann FR, Haines N. Closed-wound drainage systems. The Solcotrans Plus versus the Stryker-CBC ConstaVAC. Orthop Rev. Jun 1991;20(6):536-542. *Not eligible exposure.*
2625. Tranmer JE, Lochhaus-Gerlach J, Lam M. The effect of staff nurse participation in a clinical nursing research project on attitude towards, access to, support of and use of research in the acute care setting. Can J Nurs Leadersh. Jan-Feb 2002;15(1):18-26. *Not eligible exposure.*
2626. Travers D. Triage: how long does it take? how long should it take? J Emerg Nurs. Jun 1999;25(3):238-240. *Not eligible exposure*.
2627. Travis M. Cash in the bank. Nurs Times. Feb 12-18 1997;93(7):27. *Not eligible target population.*
2628. Treloar AJ, Macdonald AJ. Recognition of cognitive impairment by day and night nursing staff among acute geriatric patients. J R Soc Med. Apr 1995;88(4):196-198. *Not eligible target population.*
2629. Trossman S. Fighting the clock: nurses take on mandatory overtime. Am Nurse. May-Jun 1998;30(3):1, 12. *Comment.*
2630. Trossman S. ANA, MNA support Dana-Farber nurses facing disciplinary action. Am Nurse. Mar-Apr 1999;31(2):1, 10. *Comment.*
2631. Trossman S. Working 'round the clock. Am Nurse. Sep-Oct 1999;31(5):1-2. *Comment.*
2632. Trossman S. Staffing smart: a difficult proposition. Am Nurse. Jan-Feb 1999;31(1):1-2. *News.*
2633. Trossman S. The global reach of the nursing shortage. Am J Nurs. Mar 2002;102(3):85, 87, 89. *Comment.*
2634. Trossman S. Nurses' Rx for medication errors. Am Nurse. May-Jun 2003;35(3):1-2, 12. *Comment*.
2635. Trossman S. Have RN, will travel? Nurs Manage. Jul 2003;34 Suppl 4:15-16. *Comment.*
2636. Trossman S. Increased hours, more errors. Am Nurse. Jul-Aug 2004;36(4):1, 3-4. *Comment.*
2637. Trossman S. Move over eBay? A potential trend involving bidding for shifts online. Am Nurse. May-Jun 2004;36(3):1, 8, 12. *Comment.*
2638. Trundle CM, Farrington M, Anderson L, Redpath CK. GRASPing infection: a workload measurement tool for infection control nurses. J Hosp Infect. Nov 2001;49(3):215-221. *Not eligible target population.*
2639. Tsai SL, Tsai WW, Chai SK, Sung WH, Doong JL, Fung CP. Evaluation of computer-assisted multimedia instruction in intravenous injection. Int J Nurs Stud. Feb 2004;41(2):191-198. *Not eligible target population.*
2640. Tschannen D. The effect of individual characteristics on perceptions of collaboration in the work environment. Medsurg Nurs. Oct 2004;13(5):312-318. *Not eligible exposure.*
2641. Tselebis A, Moulou A, Ilias I. Burnout versus depression and sense of coherence: study of Greek nursing staff. Nurs Health Sci. Jun 2001;3(2):69-71. *Not eligible target population.*
2642. Tselikis P. It's a hard knocks life for providers ... and getting harder! State Health Care Am. 2001:40-43. *Review*.
2643. Tsuru S, Shindob S, Takatanic Y, Seod A. A conception of a support system for optimising the organisation of nursing staff from the viewpoint of the nursing care needs structure. Stud Health Technol Inform. 1997;46:275-278. *Not eligible target population.*
2644. Tucker D, Dirico L. Managing costly Medicare patients in the hospital. Geriatr Nurs. Sep-Oct 2003;24(5):294-297. *No association tested.*
2645. Tucker J. Patient volume, staffing, and workload in relation to risk-adjusted outcomes in a random stratified sample of UK neonatal intensive care units: a prospective evaluation. Lancet. Jan 12 2002;359(9301):99-107. *Not eligible target population.*
2646. Turk M, Davas A, Cicekliogluu M, Sacaklioglu F, Mercan T. Knowledge, attitude and safe behaviour of nurses handling cytotoxic anticancer drugs in Ege University Hospital. Asian Pac J Cancer Prev. Apr-Jun 2004;5(2):164-168. *Not eligible target population*.
2647. Turley S. Development of the 'Euro Rota' in A & E. Accid Emerg Nurs. Oct 1997;5(4):178-180. *Not eligible target population.*
2648. Turnbull GB. Office of Inspector General (OIG) issues draft compliance program for pharmaceutical manufacturers. Ostomy Wound Manage. Dec 2002;48(12):12-13. *Comment.*
2649. Turner G. Parents' experiences of ambulatory care. Paediatr Nurs. Oct 1998;10(8):12-13, 16. *Not eligible target population.*
2650. Turner JT, Lee V, Fletcher K, Hudson K, Barton D. Measuring quality of care with an inpatient elderly population. The geriatric resource nurse model. J Gerontol Nurs. Mar 2001;27(3):8-18. *Not eligible exposure.*
2651. Turner M. Shiftwork strategies. Can Nurse. Dec 1995;91(11):41-42. *Not eligible exposure.*
2652. Turnock C, Gibson V. Validity in action research: a discussion on theoretical and practice issues encountered whilst using observation to collect data. J Adv Nurs. Nov 2001;36(3):471-477. *Not eligible target population.*
2653. Turrill S. Interpreting family-centred care within neonatal nursing. Paediatr Nurs. May 1999;11(4):22-24. *Not eligible target population.*
2654 Turrittin J, Hagey R, Guruge S, et al. The experiences of professional nurses who have migrated to Canada: cosmopolitan citizenship or democratic racism? International journal of nursing studies Aug 2002;39(6):655-67. *Not relevant.*
2655. Tuttas CA. Decreasing nurse staffing costs in a hospital setting: development and support of core staff stability. J Nurs Care Qual. Jul-Sep 2003;18(3):226-240. *Review.*
2656. Tuttle DM. A "transfer fair" approach to staffing. Nurs Manage. Dec 1992;23(12):72-74. *Comment.*
2657. Tutuarima JA, de Haan RJ, Limburg M. Number of nursing staff and falls: a case-control study on falls by stroke patients in acute-care settings. J Adv Nurs. Jul 1993;18(7):1101-1105. *Not eligible target population.*

2658. Tyson PD, Pongruengphant R. Five-year follow-up study of stress among nurses in public and private hospitals in Thailand. Int J Nurs Stud. Mar 2004;41(3):247-254. *Not eligible target population.*
2659. Tzeng HM. Demand and supply for nursing competencies in Taiwan's hospital industry. Nurs Econ. May-Jun 2003;21(3):130-139. *Not eligible target population.*
2660. Tzeng HM. Nurses' self-assessment of their nursing competencies, job demands and job performance in the Taiwan hospital system. Int J Nurs Stud. Jul 2004;41(5):487-496. *Not eligible target population.*
2661. Tzeng HM, Ketefian S. Demand for nursing competencies: an exploratory study in Taiwan's hospital system. J Clin Nurs. Jul 2003;12(4):509-518. *Not eligible target population.*
2662. Tzeng HM, Ketefian S, Redman RW. Relationship of nurses' assessment of organizational culture, job satisfaction, and patient satisfaction with nursing care. Int J Nurs Stud. Jan 2002;39(1):79-84. *Not eligible target population.*
2663. Uchal M, Tjugum J, Martinsen E, Qiu X, Bergamaschi R. The impact of sleep deprivation on product quality and procedure effectiveness in a laparoscopic physical simulator: a randomized controlled trial. Am J Surg. Jun 2005;189(6):753-757. *Not eligible exposure.*
2664. Ugrovics A, Wright J. 12-hour shifts: does fatigue undermine ICU nursing judgments? Nursing management Jan 1990;21(1): Crit Care Manage Ed):64A, F-G. *Inadequate data presentation.*
2665. Uitterhoeve R, Duijnhouwer E, Ambaum B, van Achterberg T. Turning toward the psychosocial domain of oncology nursing: a main problem analysis in the Netherlands. Cancer Nurs. Feb 2003;26(1):18-27. *Not eligible target population.*
2666. Ullmer D. Legislative protection against mandatory overtime. Gastroenterol Nurs. Jul-Aug 2002;25(4):165-166. *Comment.*
2667. Ulrich BT, Buerhaus PI, Donelan K, Norman L, Dittus R. How RNs view the work environment: results of a national survey of registered nurses. J Nurs Adm. Sep 2005;35(9):389-396. *Not eligible exposure.*
2668. Umansky PW. Management during the off-shifts. Nurs Spectr (Wash D C). Sep 9 1996;6(19):6-7. *Comment.*
2669. Unruh L. Trends in adverse events in hospitalized patients. J Healthc Qual. Sep-Oct 2002;24(5):4-10; quiz 10, 18. *Not eligible exposure.*
2670. Unruh LY, Fottler. Projections and trends in RN supply: what do they tell us about the nursing shortage? Policy, Politics, & Nursing Practice Aug 2005;6(3):171-82. *Not relevant.*
2671. Upenieks VV. Assessing differences in job satisfaction of nurses in magnet and nonmagnet hospitals. J Nurs Adm. Nov 2002;32(11):564-576. *Not eligible exposure.*
2672. Upenieks VV. What constitutes effective leadership? Perceptions of magnet and nonmagnet nurse leaders. J Nurs Adm. Sep 2003;33(9):456-467. *Not eligible exposure.*
2673. Urden LD. Development of a nurse executive decision support database. A model for outcomes evaluation. J Nurs Adm. Oct 1996;26(10):15-21. *No association tested.*
2674. Vail JD, Morton DA, Rieder KA. Workload management system highlights staffing needs. Nurs Health Care. May 1987;8(5):289-293. *Not eligible year.*
2675. Vale MJ, Jelinek MV, Best JD, Dart AM, Grigg LE, Hare DL, Ho BP, Newman RW, McNeil JJ. Coaching patients On Achieving Cardiovascular Health (COACH): a multicenter randomized trial in patients with coronary heart disease. Arch Intern Med. Dec 8-22 2003;163(22):2775-2783. Not eligible target population.
2676. Valouxis C, Housos E. Hybrid optimization techniques for the workshift and rest assignment of nursing personnel. Artif Intell Med. Oct 2000;20(2):155-175. *Not eligible target population.*
2677. van den Bemt PM, Egberts AC, Lenderink AW, Verzijl JM, Simons KA, van der Pol WS, Leufkens HG. Adverse drug events in hospitalized patients. A comparison of doctors, nurses and patients as sources of reports. Eur J Clin Pharmacol. Apr 1999;55(2):155-158. *Not eligible target population.*
2678. Van der Geest S, Sarkodie S. The fake patient: a research experiment in a Ghanaian hospital. Soc Sci Med. Nov 1998;47(9):1373-1381. *Not eligible target population.*
2679. van der Voort PH, van der Hulst RW, Zandstra DF, van der Ende A, Kesecioglu J, Geraedts AA, Tytgat GN. Gut decontamination of critically ill patients reduces Helicobacter pylori acquisition by intensive care nurses. J Hosp Infect. Jan 2001;47(1):41-45. *Not eligible exposure.*
2680. Van Der Zwet WC, Parlevliet GA, Savelkoul PH, Stoof J, Kaiser AM, Van Furth AM, Vandenbroucke-Grauls CM. Outbreak of Bacillus cereus infections in a neonatal intensive care unit traced to balloons used in manual ventilation. J Clin Microbiol. Nov 2000;38(11):4131-4136. *Not eligible target population.*
2681. van Servellen G, Leake B. Emotional exhaustion and distress among nurses: how important are AIDS-care specific factors? Journal of the Association of Nurses in AIDS Care Mar-Apr 1994;5(2):11-9. *Not relevant.*
2682. van Servellen G, Schultz MA. Demystifying the influence of hospital characteristics on inpatient mortality rates. J Nurs Adm. Apr 1999;29(4):39-47. *Review.*
2683. Van Slyck A. A systems approach to the management of nursing services. Part III: Staffing system. Nurs Manage. May 1991;22(5):30, 32, 34. *Comment.*
2684. van Wissen K, Woodman K. Nurses' attitudes and concerns to HIV/AIDS: a focus group approach. J Adv Nurs. Dec 1994;20(6):1141-1147. *Not eligible target population.*
2685. Vanderschueren S, Van Renterghem L, Plum J, Verhofstede C, Mak R, Vincke J. Hepatitis C among risk groups for HIV and hepatitis B. Int J STD AIDS. May-Jun 1991;2(3):185-187. *Not eligible target population.*

2686. Vanderslott J. A study of incidents of violence towards staff by patients in an NHS Trust hospital. J Psychiatr Ment Health Nurs. Aug 1998;5(4):291-298. *Not eligible target population.*
2687. Vaughan CA, Reeds LB, Percifull D. A strategic nursing assistance program--SNAP. Nurs Econ. Nov-Dec 1990;8(6):426-427. *No association tested.*
2688. Vejlgaard T, Addington-Hall JM. Attitudes of Danish doctors and nurses to palliative and terminal care. Palliat Med. Mar 2005;19(2):119-127. *Not eligible target population.*
2689. Velianoff GD. Establishing a 10-hour schedule. Nurs Manage. Sep 1991;22(9):36-38. *No association tested.*
2690. Verghese C, Prior-Willeard PF, Baskett PJ. Immediate management of the airway during cardiopulmonary resuscitation in a hospital without a resident anaesthesiologist. Eur J Emerg Med. Sep 1994;1(3):123-125. *Not eligible target population.*
2691. Veyckemans F. Patient-controlled analgesia in children. Acta Anaesthesiol Belg. 1992;43(1):57-61. *Not eligible target population.*
2692. Vicca AF. Nursing staff workload as a determinant of methicillin-resistant Staphylococcus aureus spread in an adult intensive therapy unit. J Hosp Infect. Oct 1999;43(2):109-113. *Not eligible target population.*
2693. Vieira AM. Caught short-staffed. Am J Nurs. Jun 1996;96(6):63. *Comment.*
2694. Viney C, Poxon I, Jordan C, Winter B. Does the APACHE II scoring system equate with the Nottingham Patient Dependency System? Can these systems be used to determine nursing workload and skill mix? Nurs Crit Care. Mar-Apr 1997;2(2):59, 62-53. *Not eligible target population.*
2695. Vinh DT, Johnson CW, Phelps CL. Rigorously assessing whether the data backs the back school. AMIA Annu Symp Proc. 2003:1041. *Comment.*
2696. Violante FS, Fiori M, Fiorentini C, Risi A, Garagnani G, Bonfiglioli R, Mattioli S. Associations of psychosocial and individual factors with three different categories of back disorder among nursing staff. J Occup Health. Mar 2004;46(2):100-108. *Not eligible target population.*
2697. Visina CE, Chen J, Gerthoffer TD, Biggs R, Ting D. Community hospital physician and nurse attitudes about pain management. J Pain Palliat Care Pharmacother. 2003;17(2):51-62. *Not eligible exposure.*
2698. Vitacca M, Clini E, Porta R, Ambrosino N. Preliminary results on nursing workload in a dedicated weaning center. Intensive Care Med. Jun 2000;26(6):796-799. *Not eligible target population.*
2699. von Essen L, Sjoden PO. The importance of nurse caring behaviors as perceived by Swedish hospital patients and nursing staff. Int J Nurs Stud. 1991;28(3):267-281. *Not eligible target population.*
2700. von Essen L, Sjoden PO. Patient and staff perceptions of caring: review and replication. J Adv Nurs. Nov 1991;16(11):1363-1374. *Not eligible target population.*
2701. von Essen L, Sjoden PO. Perceived importance of caring behaviors to Swedish psychiatric inpatients and staff, with comparisons to somatically-ill samples. Res Nurs Health. Aug 1993;16(4):293-303. *Not eligible target population.*
2702. von Essen L, Sjoden PO. Perceived occurrence and importance of caring behaviours among patients and staff in psychiatric, medical and surgical care. J Adv Nurs. Feb 1995;21(2):266-276. *Not eligible target population.*
2703. von Essen L, Sjoden PO. The importance of nurse caring behaviors as perceived by Swedish hospital patients and nursing staff. International Journal of Nursing Studies (1991), 28, 267-281. Int J Nurs Stud. Jul 2003;40(5):487-497; discussion 499-502. *Not eligible target population.*
2703. Vonfrolio LG. Staffing ratios are the answer. Rn. Jun 2004;67(6):80. *Comment.*
2704. Vore AL. Enhancing verbal communication skills and promoting effective socialization of newly hired Spanish-speaking registered nurses. J Nurs Staff Dev. Nov-Dec 1991;7(6):286-289. *Not eligible outcomes.*
2705. Vyas A, Pickering CA, Oldham LA, Francis HC, Fletcher AM, Merrett T, Niven RM. Survey of symptoms, respiratory function, and immunology and their relation to glutaraldehyde and other occupational exposures among endoscopy nursing staff. Occup Environ Med. Nov 2000;57(11):752-759. *Not eligible target population.*
2706. Waid EO. Job sharing meets nurses' needs. Ohio Nurses Rev. Jul 1996;71(6):10-11. *Comment.*
2707. Wainwright TA. The perceived function of health care assistants in intensive care: nurses views. Intensive Crit Care Nurs. Jun 2002;18(3):171-180. *Not eligible target population.*
2708. Wakefield BJ, Blegen MA, Uden-Holman T, Vaughn T, Chrischilles E, Wakefield DS. Organizational culture, continuous quality improvement, and medication administration error reporting. Am J Med Qual. Jul-Aug 2001;16(4):128-134. *Not eligible outcomes (medication error reporting perception).*
2709. Wakefield BJ, Wakefield DS, Uden-Holman T, Blegen MA. Nurses' perceptions of why medication administration errors occur. Medsurg Nurs. Feb 1998;7(1):39-44. *Not eligible exposure.*
2710. Wakefield DS, Wakefield BJ, Borders T, Uden-Holman T, Blegen M, Vaughn T. Understanding and comparing differences in reported medication administration error rates. Am J Med Qual. Mar-Apr 1999;14(2):73-80. *Not eligible exposure.*
2711. Wakefield DS, Wakefield BJ, Uden-Holman T, Blegen MA. Perceived barriers in reporting medication administration errors. Best Pract Benchmarking Healthc. Jul-Aug 1996;1(4):191-197. *Not eligible exposure.*
2712. Wakefield DS, Wakefield BJ, Uden-Holman T, Borders T, Blegen M, Vaughn T. Understanding why medication administration errors may not be reported. Am J Med Qual. Mar-Apr 1999;14(2):81-88. *Not eligible exposure.*

2713. Walczak JR, McGuire DB, Haisfield ME, Beezley A. A survey of research-related activities and perceived barriers to research utilization among professional oncology nurses. Oncol Nurs Forum. May 1994;21(4):710-715. *Not eligible outcomes.*
2714. Waldenstrom U. Continuity of carer and satisfaction. Midwifery. Dec 1998;14(4):207-213. *Not eligible target population.*
2715. Walder B, Francioli D, Meyer JJ, Lancon M, Romand JA. Effects of guidelines implementation in a surgical intensive care unit to control nighttime light and noise levels. Crit Care Med. Jul 2000;28(7):2242-2247. *Not eligible target population.*
2716. Walker AC. Safety and comfort work of nurses glimpsed through patient narratives. Int J Nurs Pract. Feb 2002;8(1):42-48. *Not eligible target population.*
2717. Walker CA. STAR Day: one hospital's solution to educational challenges. J Nurses Staff Dev. Nov-Dec 2002;18(6):293-296. *Not eligible exposure.*
2718. Walker DD, Jones SL, Yamauchi SS, Lima C, Archer S, Mathews BP, Harris M, Kamikawa C, Irvine N, Lanier J, et al. The Queen's Medical Center Honolulu, Hawaii. Nurs Adm Q. Fall 1994;19(1):33-65. *Not eligible target population.*
2719. Walker EK. Staffing accommodations to hospital unit admissions. Nursing Economics Sep-Oct 1990;8(5):314-8. *Not relevant.*
2720. Walker J, Brooksby A, McInerny J, Taylor A. Patient perceptions of hospital care: building confidence, faith and trust. J Nurs Manag. Jul 1998;6(4):193-200. *Not eligible target population.*
2721. Walker JK. Nurse managers making a difference: creating a healing place. Semin Nurse Manag. Dec 1994;2(4):234-238. *Review.*
2722. Walker R, Adam J. Changing time in an operating suite. Int J Nurs Stud. Feb 2001;38(1):25-35. *Not eligible target population.*
2723. Walker SB, Lowe MJ. Nurses' views on reporting medication incidents. Int J Nurs Pract. Jun 1998;4(2):97-102. *Not eligible target population.*
2724. Wallace SA, Gullan RW, Byrne PO, Bennett J, Perez-Avila CA. Use of a pro forma for head injuries in the accident and emergency department--the way forward. J Accid Emerg Med. Mar 1994;11(1):33-42. *Not eligible target population.*
2725. Walrath JM, Tomallo-Bowman R, Maguire JM. Emergency department: improving patient satisfaction. Nurs Econ. Mar-Apr 2004;22(2):71-74, 55. *Not eligible exposure.*
2726. Walsh B, Steiner A, Warr J, Sheron L, Pickering R. Nurse-led inpatient care: opening the 'black box'. Int J Nurs Stud. Mar 2003;40(3):307-319. *Not eligible target population.*
2727. Walsh C. A measurable framework for improving quality. Prof Nurse. Nov 1999;15(2):80-84. *Not eligible target population.*
2728. Walters AJ. A hermeneutic study of the concept of 'focusing' in critical care nursing practice. Nurs Inq. Nov 1994;1(1):23-30. *No association tested.*
2729. Walters JA. Nurses' perceptions of reportable medication errors and factors that contribute to their occurrence. Appl Nurs Res. May 1992;5(2):86-88. *Not eligible outcomes.*
2730. Walther SM, Jonasson U, Karlsson S, Nordlund P, Johansson A, Malstam J. Multicentre study of validity and interrater reliability of the modified Nursing Care Recording System (NCR11) for assessment of workload in the ICU. Acta Anaesthesiol Scand. Jul 2004;48(6):690-696. *Not eligible target population.*
2731. Wang CE. Knowing and approaching hope as human experience: implications for the medical-surgical nurse. Medsurg Nurs. Aug 2000;9(4):189-192. *Case reports.*
2732. Ward D. Infection control: reducing the psychological effects of isolation. Br J Nurs. Feb 10-23 2000;9(3):162-170. *Not eligible exposure.*
2733. Ward D, Berkowitz B. Arching the flood: how to bridge the gap between nursing schools and hospitals. Health Aff (Millwood). Sep-Oct 2002;21(5):42-52. *Review.*
2734. Ward KG. A TEAM approach to NICU care. Rn. Feb 1999;62(2):47-49. *Comment.*
2735. Warminger P. Staff and patient communications--trends and technologies. Health Estate J. Jul 1990;44(6):2-8. *Not eligible target population.*
2736. Warren DK, Zack JE, Cox MJ, Cohen MM, Fraser VJ. An educational intervention to prevent catheter-associated bloodstream infections in a nonteaching, community medical center. Crit Care Med. Jul 2003;31(7):1959-1963. *Not eligible exposure.*
2737. Warren IB, Rozell BR. Supplemental staffing. Nurse manager views of costs, benefits, and quality of care. J Nurs Adm. Jun 1995;25(6):51-57. *Not eligible outcomes.*
2738. Washburn M. Fatigue and critical thinking on eight- and twelve-hour shifts. Nursing management Sep 1991;22(9): Crit Care Manage Ed):80A- F-H. *Inadequate data presentation.*
2739. Washington GT, Macnee CL. Evaluation of outcomes: the effects of continuous lateral rotational therapy. J Nurs Care Qual. Jul-Sep 2005;20(3):273-282. *Not eligible exposure.*
2740. Watanakunakorn C, Wang C, Hazy J. An observational study of hand washing and infection control practices by healthcare workers. Infection Control and Hospital Epidemiology Nov 1998;19(11):858-60. *Not relevant.*
2741. Waters A. A matter of life and death. Nurs Stand. Jun 30-Jul 6 1999;13(41):12-13. *Comment.*
2742. Waters A. It's all in the mix. Nurs Stand. Feb 19-25 2003;17(23):14-17. *Not eligible target population.*
2743. Watson LD, Quinn DA. Stages of stroke: a model for stroke rehabilitation. Br J Nurs. Jun 25-Jul 8 1998;7(12):suppl 8p. *Not eligible exposure.*
2744. Weaver J. Many American nurses are having trouble finding jobs. Nurs Spectr (Wash D C). Jun 17 1996;6(13):5. *News.*

2745. Webb AA, Bower DA, Gill S. Satisfaction with nursing care: a comparison of patients with HIV/AIDS, non-HIV/AIDS infectious diseases, and medical diagnoses. J Assoc Nurses AIDS Care. Mar-Apr 1997;8(2):39-46. *Not eligible exposure.*
2746. Webb D, Tour C, Hurt R, van Kammen DP. Recognizing excellence. Giving your AWE. J Nurs Adm. Sep 1992;22(9):54-56. *Not eligible exposure.*
2747. Webb SS, Price SA, Coeling HE. Valuing authority/responsibility relationships. The essence of professional practice. J Nurs Adm. Feb 1996;26(2):28-33. *Not eligible exposure.*
2748. Webber S. Cluster staffing: cooperation, competence, and caring. Todays OR Nurse. Mar-Apr 1993;15(2):5-7. *No association tested.*
2749. Weber DO. Harrison Memorial in Bremerton, Washington records satisfaction all around from 2-year-old "private practice" unit nursing experiment. Strateg Healthc Excell. Dec 1992;5(12):1-10. *Not eligible exposure.*
2750. Weber S, Herwaldt LA, McNutt LA, Rhomberg P, Vaudaux P, Pfaller MA, Perl TM. An outbreak of Staphylococcus aureus in a pediatric cardiothoracic surgery unit. Infect Control Hosp Epidemiol. Feb 2002;23(2):77-81. *Not eligible exposure.*
2751. Webster DC, Vaughn K, Martinez R. Introducing solution-focused approaches to staff in inpatient psychiatric settings. Arch Psychiatr Nurs. Aug 1994;8(4):254-261. *Not eligible exposure.*
2752. Webster J, Cowart P. An innovative professional nursing practice model. Nurs Adm Q. Spring 1999;23(3):11-16. *Comment.*
2753. Wedge C, Gosney M. Pressure-relieving equipment: promoting its correct use amongst nurses via differing modes of educational delivery. J Clin Nurs. Apr 2005;14(4):473-478. *Not eligible target population.*
2754. Weetch RM. Patient satisfaction with information received after a diagnosis of angina. Prof Nurse. Nov 2003;19(3):150-153. *Not eligible exposure.*
2755. Wehby D, Brenner PS. Perceived learning needs of patients with heart failure. Heart Lung. Jan-Feb 1999;28(1):31-40. *Not eligible exposure.*
2756. Weinberg AD, Lesene AJ, Richards CL, et al. Quality care indicators and staffing levels in a nursing facility subacute unit. Journal of the American Medical Directors Association Jan-Feb 2002;3(1):1-4. *Not relevant.*
2757. Weinstein SM, Antonova S, Goryunova M. Enhancing nurse-physician collaboration: a staffing innovation. J Nurs Adm. Apr 2003;33(4):193-195. *Review.*
2758. Weir R, Stewart L, Browne G, Roberts J, Gafni A, Easton S, Seymour L. The efficacy and effectiveness of process consultation in improving staff morale and absenteeism. Med Care. Apr 1997;35(4):334-353. *Not eligible exposure.*
2759. Weisman CS, Gordon DL, Cassard SD, Bergner M, Wong R. The effects of unit self-management on hospital nurses' work process, work satisfaction, and retention. Med Care. May 1993;31(5):381-393. *Not eligible outcomes.*
2760. Weiss JP. Using the nurse practitioner in the acute care setting. Aspens Advis Nurse Exec. Aug 1994;9(11):4-6. *Comment.*
2761. Welford M. Night shifts: light-headed night staff. Nurs Stand. Aug 5-11 1992;6(46):44-45. *Not eligible exposure.*
2762. Wells B. Taking charge of your practice. Nurs BC. Jan-Feb 1998;30(1):16-17. *Comment.*
2763. Wells N, Johnson R, Salyer S. Interdisciplinary collaboration. Clin Nurse Spec. Jul 1998;12(4):161-168. *Not eligible exposure.*
2764. Weltman AC, Short LJ, Mendelson MH, Lilienfeld DE, Rodriguez M. Disposal-related sharps injuries at a New York City Teaching Hospital. Infect Control Hosp Epidemiol. May 1995;16(5):268-274. *Not eligible exposure.*
2765. Wenzel K, Miller M, Falco J. Differentiated practice in Colorado--what's happening? Colo Nurse. Dec 1996;96(4):17-18. *Comment.*
2766. Werab B, Alexander C, Brunt B, Wester F. The use of medication modules for medication administration problems. J Nurs Staff Dev. Jan-Feb 1994;10(1):16-21. *Not eligible exposure.*
2767. Wermers MA, Dagnillo R, Glenn R, Macfarlane R, St Clair V, Scott D. Planning and assessing a cross-training initiative with multi-skilled employees. Jt Comm J Qual Improv. Jun 1996;22(6):412-426. *Not eligible exposure.*
2768. West JC. Agency not liable for actions of nurse supplied by agency. Hansen v. Caring Professionals, Inc. J Healthc Risk Manag. Fall 1997;17(4):51-53. *Comment.*
2769. Westera D. A profile of part-time faculty in Canadian university nursing programmes. Canadian Journal of Nursing Research Winter 1992;24(4):47-59. *Not relevant.*
2770. Western H. New, but hardly improved. Nurs Times. Oct 13-19 1999;95(41):49. *Not eligible target population.*
2771. Westfall NL, Burrow CM. Are daily bed linen changes necessary? Nurs Manage. Nov 1997;28(11):90-92. *Comment.*
2772. Wetzel K, Soloshy DE, Gallagher DG. The work attitudes of full-time and part-time registered nurses. Health Care Manage Rev. Summer 1990;15(3):79-85. *Not eligible outcomes.*
2773. Wheaton M. Cross-training: meeting staffing needs in the ICU. Nurs Manage. Nov 1996;27(11):32B. *Not eligible exposure.*
2774. Wheeler EC. The CNS's impact on process and outcome of patients with total knee replacement. Clin Nurse Spec. Jul 2000;14(4):159-169; quiz 170-152. *Not eligible exposure.*
2775. Wheeler J. How to delegate your way to a better working life. Nurs Times. Sep 6-12 2001;97(36):34-35. *Not eligible target population.*
2776. Whelchel C. Patients first when budgeting. Nurs Manage. Mar 2004;35(3):16. *Review.*
2777. Whiley K. The nurse manager's role in creating a healthy work environment. AACN Clin Issues. Aug 2001;12(3):356-365. *Comment.*

2778. Whitby RM, McLaws ML. Hollow-bore needlestick injuries in a tertiary teaching hospital: epidemiology, education and engineering. Med J Aust. Oct 21 2002;177(8):418-422. *Not eligible target population.*
2779. White C. Pique practice. Nurs Times. Jun 18-24 2002;98(25):24-25. *Comment.*
2780. White CL. Changing pain management practice and impacting on patient outcomes. Clin Nurse Spec. Jul 1999;13(4):166-172. *Not eligible exposure.*
2781. White F, Buswell C, Scullion J, Baldwin M. Doctor's orders. Nurs Stand. Feb 19-25 2003;17(23):21. *Not eligible target population.*
2782. White RJ. Cost-cutters eliminate skilled nurses. Revolution. Summer 1997;7(2):2. *Editorial.*
2783. Whitehead E. Staff shortages would be a thing of the past with a return to ward-based training. Nurs Times. Dec 1-7 1999;95(48):43. *Not eligible target population.*
2784. Whitman GR, Kim Y, Davidson LJ, Wolf GA, Wang SL. Measuring nurse-sensitive patient outcomes across specialty units. Outcomes Manag. Oct-Dec 2002;6(4):152-158; quiz 159-160. *Not eligible exposure.*
2785. Whittington R, Wykes T. Violence in psychiatric hospitals: are certain staff prone to being assaulted? J Adv Nurs. Feb 1994;19(2):219-225. *Not eligible target population.*
2786. Whittington R, Wykes T. An evaluation of staff training in psychological techniques for the management of patient aggression. J Clin Nurs. Jul 1996;5(4):257-261. *Not eligible exposure.*
2787. Wichowski HC, Kubsch SM, Ladwig J, Torres C. Patients' and nurses' perceptions of quality nursing activities. Br J Nurs. Oct 23-Nov 12 2003;12(19):1122-1129. *Not eligible exposure.*
2788. Widmark-Petersson V, von Essen L, Lindman E, Sjoden PO. Cancer patient and staff perceptions of caring vs clinical care. Scand J Caring Sci. 1996;10(4):227-233. *Not eligible target population.*
2789. Widmark-Petersson V, von Essen L, Sjoden PO. Perceptions of caring among patients with cancer and their staff. Differences and disagreements. Cancer Nurs. Feb 2000;23(1):32-39. *Not eligible exposure.*
2790. Wiesner G, Harth M, Szulc R, Jurczyk W, Sobczynski P, Hoerauf KH, Hobbhahn J, Taeger K. A follow-up study on occupational exposure to inhaled anaesthetics in Eastern European surgeons and circulating nurses. Int Arch Occup Environ Health. Jan 2001;74(1):16-20. *Not eligible target population.*
2791. Wiklander M, Samuelsson M, Asberg M. Shame reactions after suicide attempt. Scand J Caring Sci. Sep 2003;17(3):293-300. *Not eligible target population.*
2792. Wild D, Bradley EH. The gap between nurses and residents in a community hospital's error-reporting system. Jt Comm J Qual Patient Saf. Jan 2005;31(1):13-20. *Not eligible exposure.*
2793. Wild D, Nawaz H, Chan W, Katz DL. Effects of interdisciplinary rounds on length of stay in a telemetry unit. J Public Health Manag Pract. Jan-Feb 2004;10(1):63-69. *Not eligible exposure.*
2794. Wiles R, Postle K, Steiner A, Walsh B. Nurse-led intermediate care: patients' perceptions. Int J Nurs Stud. Jan 2003;40(1):61-71. *Not eligible target population.*
2795. Wilhoite SL, Ferguson DA, Jr., Soike DR, Kalbfleisch JH, Thomas E. Increased prevalence of Helicobacter pylori antibodies among nurses. Arch Intern Med. Mar 22 1993;153(6):708-712. *Not eligible exposure.*
2796. Wilkinson CL. An evaluation of an educational program on the management of assaultive behaviors. J Gerontol Nurs. Apr 1999;25(4):6-11. *Not eligible outcomes.*
2797. Wilkinson R. Safe practice: machine age killers. Nurs Stand. Jul 15-21 1992;6(43):44-45. *Comment.*
2798. Williams AM, Irurita VF. Therapeutically conducive relationships between nurses and patients: an important component of quality nursing care. Aust J Adv Nurs. Dec-1999 Feb 1998;16(2):36-44. *Not eligible target population.*
2799. Williams AM, Irurita VF. Therapeutic and non-therapeutic interpersonal interactions: the patient's perspective. J Clin Nurs. Oct 2004;13(7):806-815. *Not eligible target population.*
2800. Williams AM, Irurita VF. Enhancing the therapeutic potential of hospital environments by increasing the personal control and emotional comfort of hospitalized patients. Appl Nurs Res. Feb 2005;18(1):22-28. *Not eligible exposure.*
2801. Williams C, George L, Lowry M. A framework for patient assessment. Nurs Stand. Jun 15-21 1994;8(38):29-33. *No association tested.*
2802. Williams G, Slater K. Absenteeism and the impact of a 38-hour week, rostered day off option. Aust Health Rev. 2000;23(4):89-96. *Not eligible target population.*
2803. Williams KA, Stotts RC, Jacob SR, et al. Inactive nurses: a source for alleviating the nursing shortage? Journal of Nursing Administration Apr 2006;36(4):205-10. *Not relevant.*
2804. Williams J. Orienting foreign nurse graduates through preceptors. J Nurs Staff Dev. Jul-Aug 1992;8(4):155-158. *Comment.*
2805. Williams R. Happy together. Nurs Stand. Aug 23-29 2000;14(49):18-19. *Comment.*
2806. Williams R. It all adds up. Nurs Stand. Apr 19-25 2000;14(31):12-13. *Review.*
2807. Williams RP. Nurse leaders' perceptions of quality nursing: an analysis from academe. Nurs Outlook. Nov-Dec 1998;46(6):262-267. *Review.*
2808. Williams S. Missing RN would threaten safety in OR. Revolution. Jul-Aug 2000;1(4):9. *News.*
2809. Williams S, McGowan S. Professional autonomy: a pilot study to determine the effects of a professional development program on nurses' attitudes. J Nurs Staff Dev. May-Jun 1995;11(3):150-155. *Not eligible outcomes.*
2810. Williams S, Whelan A, Weindling AM, Cooke RW. Nursing staff requirements for neonatal intensive care. Arch Dis Child. May 1993;68(5 Spec No):534-538. *Not eligible target population.*

2811. Williams SA. The relationship of patients' perceptions of holistic nurse caring to satisfaction with nursing care. J Nurs Care Qual. Jun 1997;11(5):15-29. *Not eligible exposure.*
2812. Willis E. Benchmarking working time in health care: the case of Excelcare. Aust Health Rev. 2002;25(3):134-140. *Not eligible target population.*
2813. Willis J. Unpalatable options. Nurs Times. Aug 12-18 1998;94(32):28-29. *Case Reports*.
2814. Willson B. Floating to another worksite. Can I say no? Nurs BC. Apr 2002;34(2):23. *Comment.*
2815. Wilson CK. Getting results with integrity. Aspens Advis Nurse Exec. Oct 1998;14(1):2-3. *Editorial.*
2816. Wilson M. Client centred approach to community child and family care: a descriptive account of social support services provided by Plunket nurses in the central region. Nurs Prax N Z. Mar 1996;11(1):12-18. *Not eligible target population.*
2817. Wilson N. I can see clearly now. Interview by Debbie Smith. Nurs Stand. Jun 28-Jul 4 2000;14(41):18-19. *Interview.*
2818. Wilson TA, Jenkins EL. Development of a women's wellness center in Almaty, Kazakhstan. J Obstet Gynecol Neonatal Nurs. Mar-Apr 2001;30(2):231-239. *Not eligible target population.*
2819. Windsor K. Temporary assignments: a new process. Nurs Manage. Nov 1997;28(11):84-86. *Comment.*
2820. Wing KT. When flex comes to shove: staffing and hospital census. Nurs Manage. Jan 2001;32(1):43-46. *Case Reports.*
2821. Winkleman L. Nursing in Texas--a personal account. AARN News Lett. Mar 1993;49(3):10-11. *Comment.*
2822. Winnefeld M, Richard MA, Drancourt M, Grob JJ. Skin tolerance and effectiveness of two hand decontamination procedures in everyday hospital use. Br J Dermatol. Sep 2000;143(3):546-550. *Not eligible target population.*
2823. Winstead-Fry P, Bormolini S, Keech RR. Clinical care coordination program: a working partnership. J Nurs Adm. Jul-Aug 1995;25(7-8):46-51. *No association tested.*
2824. Wintle JM, Pattrin L, Crutchfield JE, Allgeier PJ, Gaston-Johansson F. Job satisfaction and the 12-hour shift. Nurs Manage. Feb 1995;26(2):54. *Comment.*
2825. Wirt GL. Causes of institutionalism: patient and staff perspectives. Issues Ment Health Nurs. May-Jun 1999;20(3):259-274. *Not eligible target population.*
2826. Wise LC. The erosion of nursing resources: employee withdrawal behaviors. Res Nurs Health. Feb 1993;16(1):67-75. *Not eligible outcomes.*
2827. Witchell L. Managing international recruits. Nurs Manag (Harrow). Jun 2002;9(3):10-14. *Not eligible target population.*
2828. Wolf G, Gabriel VH, Omachonu VK. Using simulation to project staffing levels. Nurs Manage. Aug 1992;23(8):64A, 64D, 64F passim. *Not eligible outcomes.*
2829. Wolf ZR, Colahan M, Costello A. Relationship between nurse caring and patient satisfaction. Medsurg Nurs. Apr 1998;7(2):99-105. *Not eligible exposure.*
2830. Wolf ZR, Haakenson DA, Jablonski RA, McGoldrick TB. Nurses' perceptions of harmful outcomes from medication errors. Medsurg Nurs. Dec 1995;4(6):460-467, 471. *Not eligible outcomes.*
2831. Wolsieffer D. Retention and work environment. Nurs Econ. May-Jun 2004;22(3):165. *Letter.*
2832. Wong DF, Leung SS, So CK. Differential impacts of coping strategies on trati the mental health of Chinese nurses in hospitals in Hong Kong. Int J Nurs Pract. Jun 2001;7(3):188-198. *Not eligible target population.*
2833. Wong FK, Chow S, Chang K, Lee A, Liu J. Effects of nurse follow-up on emergency room revisits: a randomized controlled trial. Soc Sci Med. Dec 2004;59(11):2207-2218. *Not eligible target population.*
2834. Wood CJ. Can nurses safely assess the need for endotracheal suction in short-term ventilated patients, instead of using routine techniques? Intensive Crit Care Nurs. Aug 1998;14(4):170-178. *Not eligible target population.*
2835. Wood D. Acting on complaints about mental health services. Implications of power imbalances. J Manag Med. 1996;10(3):31-38. *Not eligible target population.*
2836. Wood D. Nurses receive bonuses for patient satisfaction. Pa Nurse. Jan-Feb 2004;59(1):4. *News.*
2837. Wood L. Autotransfusion in the postanesthesia care unit. J Post Anesth Nurs. Apr 1991;6(2):98-101. *Not eligible outcomes.*
2838. Woodcraft B. Shift work: benighted existence. Nurs Stand. Mar 18-24 1992;6(26):46. *Comment.*
2839. Woodhouse AJ. A late shift in accident and emergency. Accid Emerg Nurs. Oct 1995;3(4):219-220. *Not eligible target population.*
2840. Woodward W. Preparing a new workforce. Nurs Adm Q. Jul-Sep 2003;27(3):215-222. *Review.*
2841. Woogara J. Patients' rights to privacy and dignity in the NHS. Nurs Stand. Jan 12-18 2005;19(18):33-37. *Not eligible target population.*
2842. Woolliscroft JO, Howell JD, Patel BP, Swanson DB. Resident-patient interactions: the humanistic qualities of internal medicine residents assessed by patients, attending physicians, program supervisors, and nurses. Acad Med. Mar 1994;69(3):216-224. *Not eligible exposure.*
2843. Wootten N. Evaluation of 12-hour shifts on a cardiology nursing development unit. Br J Nurs. Nov 9-22 2000;9(20):2169-2174. *Not eligible target population.*
2844. Worthington K. Reproductive hazards on the job. Am J Nurs. Oct 2001;101(10):104. *Comment.*
2845. Wortley V, Grierson-Hill L. Developing a successful self-rostering shift system. Nurs Stand. Jul 2-8 2003;17(42):40-42. *Not eligible target population.*
2846. Wotton K, Gassner LA, Ingham E. Flushing an i.v. line: a simple but potentially costly procedure for both patient and health unit. Contemp Nurse. Oct 2004;17(3):264-273. *Not eligible target population.*
2847. Wright B. Nursing: an ageing population. Accid Emerg Nurs. Apr 1998;6(2):65. *Editorial.*

2848. Wright B. Can you work? Accid Emerg Nurs. Jul 2000;8(3):127. *Editorial.*
2849. Wright S. Standing up for Pink. Nurs Times. Oct 3-9 1990;86(40):18. *Comment.*
2850. Wright S. Eastern light. Nurs Stand. Nov 24-30 2004;19(11):20-21. *Comment.*
2851. Wright V. It just doesn't add up. Br J Perioper Nurs. Jul 2004;14(7):300. *Not eligible target population.*
2852. Wrona-Sexton S. Patient classification systems: another perspective. Nurs Manage. Dec 1992;23(12):38-39. *Not eligible exposure.*
2853. Wu ML, Courtney M, Berger G. Models of nursing care: a comparative study of patient satisfaction on two orthopaedic wards in Brisbane. Aust J Adv Nurs. Jun-Aug 2000;17(4):29-34. *Not eligible target population.*
2854. Wylie DM. Staffing to meet patient care needs. Can J Nurs Adm. Jan-Feb 1998;11(1):5-6. *Editorial.*
2855. Wynd C. Leapfrog Group jumps over nursing. Nurs Manage. Dec 2002;33(12):20. *News.*
2856. Wynd CA, Samstag DE, Lapp AM. Bacterial carriage on the fingernails of OR nurses. Aorn J. Nov 1994;60(5):796, 799-805. *Not eligible exposure.*
2857. Yang KP. Relationships between nurse staffing and patient outcomes. J Nurs Res. Sep 2003;11(3):149-158. *Not eligible target population.*
2858. Yang KP, Huang CK. The effects of staff nurses' morale on patient satisfaction. J Nurs Res. Jun 2005;13(2):141-152. *Not eligible exposure.*
2859. Yang Y, Koh D, Ng V, Lee FC, Chan G, Dong F, Chia SE. Salivary cortisol levels and work-related stress among emergency department nurses. J Occup Environ Med. Dec 2001;43(12):1011-1018. *Not eligible target population.*
2860. Yassi A, Tate R, Cooper J, Jenkins J, Trottier J. Causes of staff abuse in health care facilities. Implications for prevention. Aaohn J. Oct 1998;46(10):484-491. *Not eligible exposure.*
2861. Yeakel S, Maljanian R, Bohannon RW, Coulombe KH. Nurse caring behaviors and patient satisfaction: improvement after a multifaceted staff intervention. J Nurs Adm. Sep 2003;33(9):434-436. *Not eligible exposure.*
2862. Yeh SH, Lee LN, Ho TH, Chiang MC, Lin LW. Implications of nursing care in the occurrence and consequences of unplanned extubation in adult intensive care units. Int J Nurs Stud. Mar 2004;41(3):255-262. *Not eligible target population.*
2863. Yeung SS, Genaidy A, Deddens J, Sauter S. The relationship between protective and risk characteristics of acting and experienced workload, and musculoskeletal disorder cases among nurses. J Safety Res. 2005;36(1):85-95. *Not eligible target population.*
2864. Yi M, Jezewski MA. Korean nurses' adjustment to hospitals in the United States of America. J Adv Nurs. Sep 2000;32(3):721-729. *Not eligible outcomes.*
2865. Yip VY. New low back pain in nurses: work activities, work stress and sedentary lifestyle. J Adv Nurs. May 2004;46(4):430-440. *Not eligible outcomes.*
2866. Yip Y. A study of work stress, patient handling activities and the risk of low back pain among nurses in Hong Kong. J Adv Nurs. Dec 2001;36(6):794-804. *Not eligible target population.*
2867. Yoder LH. Staff nurses' career development relationships and self-reports of professionalism, job satisfaction, and intent to stay. Nurs Res. Sep-Oct 1995;44(5):290-297. *Not eligible target population.*
2868. Young J. Changing attitudes towards families of hospitalized children from 1935 to 1975: a case study. J Adv Nurs. Dec 1992;17(12):1422-1429. *Not eligible exposure.*
2869. Young WB, Lehrer EL, White WD. The effect of education on the practice of nursing. Image J Nurs Sch. Summer 1991;23(2):105-108. *Not eligible outcomes.*
2870. Young WB, Minnick AF, Marcantonio R. How wide is the gap in defining quality care? Comparison of patient and nurse perceptions of important aspects of patient care. J Nurs Adm. May 1996;26(5):15-20. *Not eligible exposure.*
2871. Yurugen B. Patient-centred care in Turkey. Edtna Erca J. Apr-Jun 2002;28(2):95-96. *Not eligible target population.*
2872. Yuska C, Crabtree-Tonges M, Schaps MT. Staff nurse weekend program proves cost effective. Nurs Adm Q. Winter 1984;8(2):62-73. *Not eligible year.*
2873. Zahr LK, William SG, el-Hadad A. Patient satisfaction with nursing care in Alexandria, Egypt. Int J Nurs Stud. 1991;28(4):337-342. *Not eligible target population.*
2874. Zahourek RP. Intentionality: evolutionary development in healing: a grounded theory study for holistic nursing. Journal of Holistic Nursing Mar 2005;23(1):89-109. *Not relevant.*
2875. Zarich S, Pust-Marcone J, Amoateng-Adjepong Y, Manthous CA. Failure of a brief educational program to improve interpretation of pulmonary artery occlusion pressure tracings. Intensive Care Med. Jun 2000;26(6):698-703. *Not eligible exposure.*
2876. ZborilBenson LR. Why nurses are calling in sick: the impact of heath-care restructuring. Canadian Journal of Nursing Research Mar 2002;33(4):89-107. *Not relevant.*
2877. Zeler KM, McPharlane TJ, Salamonsen RF. Effectiveness of nursing involvement in bedside monitoring and control of coagulation status after cardiac surgery. Am J Crit Care. Sep 1992;1(2):70-75. *Not eligible target population.*
2878. Zeleznik J, Agard-Henriques B, Schnebel B, Smith DL. Terminology used by different health care providers to document skin ulcers: the blind men and the elephant. J Wound Ostomy Continence Nurs. Nov 2003;30(6):324-333. *Not eligible exposure.*
2879. Ziegler E, Mason HJ, Baxter PJ. Occupational exposure to cytotoxic drugs in two UK oncology wards. Occup Environ Med. Sep 2002;59(9):608-612. *Not eligible target population.*
2880. Zimmermann PG. "On call" staffing. J Emerg Nurs. Dec 1993;19(6):529-531. *Comment.*

2881. Zimmermann PG. Use of "stat" nurses in the emergency department. J Emerg Nurs. Aug 1995;21(4):335-337. *Comment.*
2882. Zimmermann PG. Self-scheduling in the emergency department. J Emerg Nurs. Feb 1995;21(1):58-61. *Comment.*
2883. Zimmermann PG, Will TL, Soules DM, Fiore T. Avoiding registered nurse layoffs: three hospitals share how it's done. J Emerg Nurs. Aug 1996;22(4):323-327. *Comment.*
2884. Zohar Z, Eitan A, Halperin P, Stolero J, Hadid S, Shemer J, Zveibel FR. Pain relief in major trauma patients: an Israeli perspective. J Trauma. Oct 2001;51(4):767-772. *Not eligible target population.*
2886. Zurbrugg HR, Piehler S, Weiss HM. How to run a heart surgical unit: experiences during the first year of the Department of Cardiothoracic and Vascular Surgery, University Clinic of Regensburg. J Cardiovasc Surg (Torino). Feb 1997;38(1):53-61. *Not eligible target population.*

Appendix C: Technical Expert Panel Members and Affiliation

Peer reviewer comments on a preliminary draft of this report were considered by the EPC in preparation of this final report. Synthesis of the scientific literature presented here does not necessarily represent the views of individual reviewers.

TEP Member	Affiliation
Sandra Edwardson, Ph.D., R.N.	School of Nursing University of Minnesota
Colleen Goode, R.N., Ph.D., F.A.A.N.	Patient Care Services University of Colorado Hospital
Christine Kovner, Ph.D., R.N.	College of Nursing New York University
Barbara Mark, R.N., Ph.D., F.A.A.N.	School of Nursing University of North Carolina at Chapel Hill
Jack Needleman, Ph.D.	School of Public Health UCLA
Pamela Thompson, M.S., R.N., F.A.A.N.	Chief Executive Officer American Organization of Nurse Executives

Appendix D: Sample Abstraction Forms

Nurse Staffing in North American Hospitals
Staffing Ratios/Patient Outcomes Abstraction Form

(Complete for each study**)**

Number of the study_____
First author_____
Year of the publication _____
Journal of the publication_____
Database to identify the study_____
Person to score the study_____

Publication type (check one)
☐ Published article
☐ Administrative report
☐ Dissertation
☐ Abstract/Presentation
☐ Book/book chapter

Purpose/aim of study _____

Design of the study (check one)
☐ prospective cohort
☐ retrospective cohort
☐ cross-sectional
☐ descriptive study
☐ case-control
☐ case-series
☐ randomized controlled clinical trial
☐ not randomized clinical interventions
☐ ecologic

Nurse staffing variables (independent variables)

1. Mark Yes/No by assessment in the study.
2. Provide the definition of each variable used in the article.

Data source for nurse staffing variables (define) _____

Nurse to patient ratios:

Registered nurse/patient ratio

☐ Yes ☐ No

If Yes, define _____

Licensed nurse practitioner/patient ratio

☐ Yes ☐ No

If Yes, define _____

Aid/patient ratio, number of patients/aid

☐ Yes ☐ No

If Yes, define _____

Proportion of RN among nursing personnel

☐ Yes ☐ No

If Yes, define _____

Licensed nurses/patient ratio

☐ Yes ☐ No

If Yes, define _____

Proportion of licensed nurses among nursing personnel

☐ Yes ☐ No

If Yes, define _____

Measures of nurse work hours

Total hours of care/patient day

☐ Yes ☐ No

If Yes, define _____

Registered nurse hours/patient day

☐ Yes ☐ No

If Yes, define _____

Licensed nurse hours/patient day

☐ Yes ☐ No

If Yes, define _____

Aid hours /patient day

☐ Yes ☐ No

If Yes, define _____

Patient outcomes variables

1. Mark Yes/No by assessment in the study.
2. Provide the definition of the variable used in the article.

Mortality

☐ Yes ☐ No

If Yes, define _____

Data source to measure mortality : _____

Time of follow up from the day of surgery to death, in days_____

Time of follow up from hospitalization to death , in days_____

Mortality rate in groups with different staffing levels

☐ Yes ☐ No

If yes, how reported (mark all applicable):

☐ Number of events

☐ Proportion in %

☐ Relative risk

Adverse drug events

1. Mark Yes/No by assessment in the study.
2. Provide the definition of each variable used in the article.
3. Provide the data source to measure the outcome.
4. Mark how the outcome was reported

Variable	Assessment in the study		Definition	Source to measure	Reporting number of events	Proportion in %	Relative risk
	Yes	No					
Adverse events							
Other							

Length of stay.

Length of stay in the unit, days

☐ Yes ☐ No

Length of stay in the hospital, days

☐ Yes ☐ No

Data source to measure LOS _____

Data extraction table: Complete cells with values of LOS reported in the article

	Categories of independent staffing variable	LOS					
Exposure variable		Mean	STD	Median	RR	Lower 95%CL	Upper 95%CL
LOS in hospital in days							
LOS in units in days							

Nurse quality outcomes

1. Mark Yes/No by assessment in the study.
2. Provide the definition of each variable used in the article.
3. Provide the data source to measure the outcome.
4. Mark how the outcome was reported

Variable	Assessment in the study		Definition	Source to measure	Reporting number of events	Proportion in %	Relative risk
	Yes	No					
Falls							
Injury							
Pressure ulcers							
Failure to rescue							

Patient satisfaction.

1. Mark Yes/No by assessment in the study.
2. Mark how the outcome was reported

Variable	Assessment in the study		Reporting scores	% of favorable responses	Relative risk
	Yes	No			
Satisfaction with nurse care					
Satisfaction with education					
Satisfaction with pain management					

Time from the hospitalization to the measurement of the patient satisfaction, in days _____ days

Patient satisfaction scale (define)_____

Quality Measures:

Patient related:
1. Mark Yes/No by assessment in the study.
2. Provide the definition of each variable used in the article.
3. Provide the data source to measure the outcome.
4. Mark how the outcome was reported

Variable	Assessment in the study		Definition	Source to measure	Reporting number of events	Proportion in %	Relative risk
	Yes	No					
Urinary tract infection							
Postoperative complications							
Gastrointestinal bleeding							
Hospital-acquired pneumonia							
Shock							
Atelectasis or pulmonal failure							
Accidental extubation							
Nosocomial infection							
Surgical wound infection							
Post surgical thrombosis							
Cardio-pulmonary arrest							
Any complication							
Any Medical complication							
Any surgical complication							
Sepsis							
Post surgical bleeding							
Other							

Nurses related:

1. Mark Yes/No by assessment in the study.
2. Provide the definition of each variable used in the article.
3. Provide the data source to measure the outcome.
4. Mark how the outcome was reported

Variable	Assessment in the study		Definition	Source to measure	Reporting number of events	Proportion in %	Relative risk
	Yes	No					
Turnover rate							
Burnout							
Vacancy							

Nurse self-reported.

1. Mark Yes/No by assessment in the study.
2. Provide the definition of each variable used in the article.
3. Provide scale to measure the outcome.
4. Mark how the outcome was reported

Variable	Assessment in the study		Definition	Scale to measure	Reporting scores	% favorable responses	Relative risk
	Yes	No					
Satisfaction with job							
Perception of adequacy of staffing							
Perception of quality care							
Autonomy of nurses							
Nurses Governance							
Stress							

Patient characteristics.

Patient Eligibility criteria
Complete the table with definitions used in the article:

	Inclusion criteria	Exclusion criteria
Age		
Sex		
Race		
Insurance		
Residency		
Hospitalization		
Availability of records		
Diagnosis (ICD code)		
Comorbidities		
Severity		
Acuity		
Other		

Patients
☐ Medical % of the sample _____
☐ Surgical % of the sample _____
☐ Adults % of the sample _____
☐ Pediatric % of the sample _____
☐ combined _____

Sample characteristics:
Complete with values reported in the article and with page number in the article where the data was extracted:

	Page in the article	Exposure categories	
Exposure :			
# Subjects			
Mean age			
Sex			
% of males			
Not reported			
Race (%)			
White			
Black			
Asian			
Other			
Not reported			
Ethnicity(%)			
Hispanic			
Not Hispanic			
Other			

Not reported			
Socioeconomic status (Scores)			
Not reported			
Primary diagnosis			
% ICD codes			
Co morbidities (case-mix index)			
Severity			
Acuity			
DRG			

Nurse characteristics.
Nurse eligibility criteria
Complete the table with definitions used in the article:

	Inclusion criteria	**Exclusion criteria**
Age		
License		
Experience		
Gender		
Working status		
Self-selection		
Other		

Nurses sample characteristics:
Complete with values reported in the article and with page number in the article where the data was extracted:

	Page in the article	**Exposure categories**	
Exposure :			
Mean age			
Gender			
% of males			
Not reported			
Race (%)			
White			
Black			
Asian			
Other			
Not reported			

Ethnicity (%)			
Hispanic			
Not Hispanic			
Other			
Not reported			
Foreign graduates %			
Not reported			

Other nurse characteristics which may impact patients outcomes:

1. Mark Yes/No by assessment in the study.
2. Provide the data source to measure the outcome.

Nurse education

☐ Yes ☐ No

Data Source _____

Nurse degree

☐ Yes ☐ No

Data Source _____

	Nursing degree	Non nursing degree
Associated degree		
Diploma		
BSN		
MS		
Doctorate		

Nurse experience in years (in nursing)

☐ Yes ☐ No

Data Source _____

Proportion of nurses with temporary positions (pool nurses)

☐ Yes ☐ No

Data Source _____

Nursing unions

☐ Yes ☐ No

Data Source _____

Organization characteristics which may impact patient outcomes.

Hospital eligibility criteria
Complete the table with definitions used in the article:

	Inclusion criteria	Exclusion criteria
Data source		
Location		
Size		
Care		
Teaching status		
Ownership		
Availability of information		
Self-selection		
Other		

Status of selected hospital(s)
☐ Number of eligible hospitals
☐ Number of enrolled hospitals
☐ Number of analyzed hospitals

if more than 1:
☐ Teaching, % of the sample _____
☐ Not teaching, % of the sample _____
☐ Combined sample
Location _____
Size (number of beds) _____
Ownership
☐ profit, % of the sample _____
☐ non profit, % of the sample _____
☐ public, % of the sample _____
☐ private, % of the sample _____
Technology index _____
☐ not reported
Computerization of communication and records _____
☐ not reported
Central hospital support adequacy _____
☐ not reported
HMO penetrating _____
☐ not reported

Clinical units
☐ Intensive care unit
☐ Labor and delivery
☐ Pre-natal
☐ Post-natal
☐ Nursery
☐ Emergency
☐ Trauma
☐ Critical care
☐ Visits
☐ Hospital general
☐ Medical
☐ Surgical
☐ Operating room
☐ Pediatric

☐ Post-anesthesia
☐ Psychiatry
☐ Specialty
☐ Step down units
☐ Telemetry
☐ Combined
☐ Unknown

Data extraction tables.

/*Complete with values reported in the article with the page number in the articles the data was extracted for a quality control*/
/*Add as many lines for categories as necessary*/
/*Median is calculated when ranges only reported assuming normal distribution*/
/*Increment is analyzed when regression coefficients only reported*/

Staffing variables:

Variable	Categories defined by authors	Mean	STD	95%CL	Median	Page number
Ratios						
Registered nurse/patient ratio						
Licensed nurse/patient ratio						
Aid/patient ratio, number of patients/aid						
Number of Patients/Licensed nurses						
Proportion of RN among total nursing personnel in %						
Proportion of licensed nurses /total nursing staff in %						
Hours						
Total hours of care/patient day						
Registered nurse hours/patient day						
Licensed nurse hours/patient day						
Aid hours /patient day						

Patient outcomes.

/*Add lines for interactions Exposure*Interaction factor*/

Outcomes	Exposure categories (treatment groups)	Rate in %			Rate in %	Events	Subjects	Page
		Mean	STD	95%CL	Median			
Mortality								
Nurse quality outcomes								
Urinary tract infection								
Falls								
Injury								
Pressure ulcers								
Any complication								
Any Medical complication								
Any surgical complication								
Nosocomial infections								
Sepsis								
Surgical wound infection								
Postoperative complications								
Gastrointestinal bleeding								
Post surgical bleeding								
Hospital-acquired pneumonia								
Atelectasis or pulmonal failure								
Accidental extubation								
Post surgical Thrombosis								
Cardio-pulmonary arrest								
Failure to rescue								
Shock								

Continuation of the previous table:

Outcomes	Exposure categories	Relative Risk (RR)	Lower 95%CL of RR	Upper 95%CL of RR		Page
Mortality						
Nurse quality outcomes						
Falls						
Injury						
Pressure ulcers						
Urinary tract infection						
Any complication						
Any Medical complication						
Any surgical complication						

Nosocomial infections						
Sepsis						
Surgical wound infection						
Postoperative complications						
Gastrointestinal bleeding						
Post surgical bleeding						
Hospital-acquired pneumonia						
Atelectasis or pulmonal failure						
Accidental extubation						
Post surgical Thrombosis						
Cardio-pulmonary arrest						
Failure to rescue						
Shock						

Patient Satisfaction

Outcomes	Exposure	Exposure categories (treatment groups)	Mean	STD	95%CL	Median	Page
Satisfaction with nurse care							

Continuation of the previous table:

Outcomes	Exposure categories	Relative Risk (RR)	Lower 95%CL of RR	Upper 95%CL of RR	Page
Satisfaction with nurse care					
Satisfaction with pain management					

Nurse characteristics:

Variable	Categories defined by authors	Mean	STD	95%CL	Median	Page
Nurses characteristics						
Nurse experience in years						
Nurses education (%)						
Associate degree						
BSN						
MS						
PhD						
Proportion of nurses with temporary positions (pool nurses) in %						
Organization characteristics						
Duration of shift in hours						
Proportion of nurses working full time						

Variable	Categories defined by authors	Mean	STD	95%CL	Median	Page
Turnover rate						
Burnout, %						
Vacancy, %						
Nurses self-reported variables						
Satisfaction with job, % satisfied						
Perception of adequacy of staffing, % perceived as adequate						
Perception of quality care, % of satisfied						
Autonomy of nurses, % perceived as adequate						
Nurses Governance, % perceived as adequate						
Stress, % of perceived as significant						

ASSESSMENT OF STUDY QUALITY

OBSERVATIONAL STUDIES (*based on "Systems to Rate the Strength Of Scientific Evidence, AHRQ Publication No. 02-E016, April 2002*)

Score each domain on a scale of 0 (poor, not defined) to 5 (excellent, clearly defined)

Observational Studies Quality Domains/Elements	**Score**
Study question clearly focused and appropriate ***Notes:***	
Sampling of Study Population Random Convenient Self-selected ***Notes:***	
Clear definition of exposure ***Notes:***	
Primary/secondary outcomes defined ***Notes:***	
Statistical Analysis: Assessment of confounding attempted Did the analysis adjust for or examine the effects of various factors Patient characteristics Hospital characteristics Cluster of patients and hospitals ***Notes:***	
Statistical methods used to take into account the effect of more than one variable on the outcome such as multiple regression, multivariate analysis, regression modeling -*see methods in paper* ***Notes:***	
Measure of effect for outcomes and appropriate measure of precision (SE, 95%CL) ***Notes:***	
Conclusions supported by results with possible bias and limitations taken into consideration ***Notes:***	
Single versus Multi-site study (*note one of the other*) ***Notes:***	
Co morbidities mentioned ***Notes****:*	
Co morbidities incorporated in the analyses ***Notes:***	
Total score	

INTERVENTIONAL STUDIES.

Intervention Studies Quality Domains/Elements	**Score**
Study question clearly focused and appropriate ***Notes:***	
Sampling of Study Population Random Convenient Self-selected ***Notes:***	
Clear definition of exposure ***Notes:***	
Randomization used to allocate patients (units) into treatment groups ***Notes:***	
Randomization allocation concealment method **Clearly adequate:** Centralized randomization by telephone, randomization scheme controlled by pharmacy, numbered or coded identical containers administered sequentially, on site computer system which can only be accessed after entering the characteristics of an enrolled participant, sequentially numbered sealed opaque envelopes. **Clearly Inadequate:** Alternation (consequent, odd-even, etc.), date of birth, date of week	
Sample size Justification of the sample size for each tested hypothesis	
Statistical Analysis: Assessment of adequacy of randomization - distribution of confounding factors at baseline in treatment groups: Patient characteristics Hospital characteristics Cluster of patients and hospitals ***Notes:***	
Intention to treat analysis. All eligible patients (units) included into analysis. ***Notes:***	
For each primary and secondary outcome, a summary of results for each group, and the estimated effect size and its precision (SE, 95% confidence interval). ***Notes:***	
Conclusions supported by results with clinical significance of effect size ***Notes:***	
Single versus Multi-site study (*note one of the other*) ***Notes:***	
Total score	

Study design characteristics

Adequacy of the sampling (random selection or not) (*check one*)

☐ random sampling
☐ convenience sampling
☐ non-random sampling
☐ single hospital study
☐ self-selected
☐ not specified
☐ all sampled subjects were analyzed
☐ sampled subjects were excluded from the analysis_____%

95% CL as reported estimates of the association between exposure and outcomes

☐ Yes ☐ No

P value as reported estimates of the association between exposure and outcomes

☐ Yes ☐ No

Correlation coefficient reported between exposure and outcomes

☐ Yes ☐ No

Propensity scores used for nonrandom unequal distribution of confounding factors among treatment groups

☐ Yes ☐ No

Adjustment for confounding factors:

Adjustment for age of the patients

☐ Yes ☐ No

Adjustment for race of the patients

☐ Yes ☐ No

Adjustment for patient sex

☐ Yes ☐ No

Adjustment for patient Diagnoses/comorbidities

☐ Yes ☐ No

Adjustment for socioeconomic status of the patients

☐ Yes ☐ No

Adjustment for hospital (provider) characteristics

☐ Yes ☐ No

Country
☐ Canada
☐ State or province abbreviation
☐ Combined

Sampling units (can be more than one)
☐ patients †
☐ hospitals
☐ hospital units
☐ nurses
☐ other (define)_____

Analytic unit (can be more than one)
☐ patients
☐ hospitals †-
☐ hospital units †-
☐ nurses

Level of evidence of the individual study (check one)

Interventions:
☐ I – Well-designed randomized controlled trial
☐ II-1A - Well-designed controlled trial with pseudo-randomization
☐ I-1B - Well-designed controlled trial without randomization

Observational studies

☐ I-2A - Well-designed cohort (prospective) study with concurrent controls
☐ I-2B - Well-designed cohort (prospective) study with historical controls
☐ II-2C - Well-designed cohort (retrospective) study with concurrent controls
☐ II-3 – Well-designed case-controlled (retrospective) study
☐ III – Large differences from comparisons between times and/or places
☐ IY – Opinion of respected authorities based in clinical experience

Nurse Staffing in North American Hospitals
Nursing Staffing Strategies /Patient Outcomes Abstraction Form

(Complete for each study)

Number of the study_____
First author_____
Year of the publication _____
Journal of the publication_____
Database to identify the study_____
Person to score the study_____

Publication type (check one)
☐ Published article
☐ Administrative report
☐ Dissertation
☐ Abstract/Presentation
☐ Book/book chapter

Purpose/aim of study _____

Design of the study (check one)
☐ prospective cohort
☐ retrospective cohort
☐ cross-sectional
☐ descriptive study
☐ case-control
☐ case-series
☐ randomized controlled clinical trial
☐ not randomized clinical interventions
☐ ecologic

Nurse staffing strategies (independent variables).

1. Mark Yes/No by assessment in the study.
2. Provide the definition of each variable used in the article.

Data source for variables (define) _____

Use of temporary nursing agencies
☐ Yes ☐ No

If Yes, define _____

Use of part time nurses
☐ Yes ☐ No

If Yes, define _____

Proportion of registered nurses
☐ Yes ☐ No

If Yes, define _____

Experience mix of the nursing staffs
☐ Yes ☐ No

If Yes, define _____

Continuing nurse education
☐ Yes ☐ No

If Yes, define _____

Nurse staffing models
1. Mark Yes/No by assessment in the study.
2. Provide the definition of staffing strategies (changes in staffing) used in the article

Patient Focused Care
☐ Yes ☐ No

If Yes, define _____

Primary or Total Nursing Care
☐ Yes ☐ No

If Yes, define _____

Team or Functional Nursing Care
☐ Yes ☐ No

If Yes, define _____

Magnet Hospital Environment/Shared governance
☐ Yes ☐ No

If Yes, define _____

Evidence Based Clinical Pathway
☐ Yes ☐ No

If Yes, define _____

Staff scheduling strategies:

Shift
☐ Yes ☐ No

If Yes, define _____

Duration of shift in hours
☐ Yes ☐ No

If Yes, define _____

Over time work
☐ Yes ☐ No

If Yes, define _____

Decentralized scheduling – nurse manager
☐ Yes ☐ No

If Yes, define _____

Patient outcomes variables

1. Mark Yes/No by assessment in the study.
2. Provide the definition of the variable used in the article.

Mortality

☐ Yes ☐ No

If Yes, define _____

Data source to measure mortality :_____

Time of follow up from the day of surgery to death, in days_____

Time of follow up from hospitalization to death , in days_____

Mortality rate in groups with different staffing levels
☐ Yes ☐ No

If yes, how reported (mark all applicable):

☐ Number of events

☐ Proportion in %

☐ Relative risk

Adverse Drug Events.

1. Mark Yes/No by assessment in the study.
2. Provide the definition of each variable used in the article.
3. Provide the data source to measure the outcome.
4. Mark how the outcome was reported

Variable	Assessment in the study		Definition	Source to measure	Reporting number of events	Proportion in %	Relative risk
	Yes	No					
Adverse events							
Other							

Length of stay.

Length of stay in the unit, days
☐ Yes ☐ No

Length of stay in the hospital, days

☐ Yes ☐ No

Data source to measure LOS _____

Data extraction table: Complete cells with values of LOS reported in the article

	Categories of independent staffing variable	LOS					
Exposure variable		**Mean**	**STD**	**Median**	**RR**	**Lower 95%CL**	**Upper 95%CL**
LOS in hospital in days							
LOS in units in days							

Nurse quality outcomes

1. Mark Yes/No by assessment in the study.
2. Provide the definition of each variable used in the article.
3. Provide the data source to measure the outcome.
4. Mark how the outcome was reported

Variable	Assessment in the study		Definition	Source to measure	Reporting number of events	Proportion in %	Relative risk
	Yes	**No**					
Falls							
Injury							
Pressure ulcers							
Failure to rescue							

Patient satisfaction.

1. Mark Yes/No by assessment in the study.
2. Mark how the outcome was reported

Variable	Assessment in the study		Reporting scores	% of favorable responses	Relative risk
	Yes	No			
Satisfaction with nurse care					
Satisfaction with education					
Satisfaction with pain management					

Time from the hospitalization to the measurement of the patient satisfaction, in days _____ days

Patient satisfaction scale (define)_____

Other Quality Measures:

Patient related:

1. Mark Yes/No by assessment in the study.
2. Provide the definition of each variable used in the article.
3. Provide the data source to measure the outcome.
4. Mark how the outcome was reported

Variable	Assessment in the study		Definition	Source to measure	Reporting number of events	Proportion in %	Relative risk
	Yes	No					
Urinary tract infection							
Postoperative complications							
Gastrointestinal bleeding							
Hospital-acquired pneumonia							
Shock							
Atelectasis or pulmonal failure							
Accidental extubation							
Nosocomial infection							

Surgical wound infection							
Post surgical thrombosis							
Cardio-pulmonary arrest							
Any complication							
Any Medical complication							
Any surgical complication							
Sepsis							
Post surgical bleeding							
Other							

Nurses related:

1. Mark Yes/No by assessment in the study.
2. Provide the definition of each variable used in the article.
3. Provide the data source to measure the outcome.
4. Mark how the outcome was reported

Variable	Assessment in the study		Definition	Source to measure	Reporting number of events	Proportion in %	Relative risk
	Yes	No					
Turnover rate							
Burnout							
Vacancy							

Nurse self-reported.

1. Mark Yes/No by assessment in the study.
2. Provide the definition of each variable used in the article.
3. Provide scale to measure the outcome.
4. Mark how the outcome was reported

Variable	Assessment in the study		Definition	Scale to measure	Reporting scores	% favorable responses	Relative risk
	Yes	No					
Satisfaction with job							
Perception of adequacy of staffing							
Perception of quality care							

Patient characteristics.

Patient Eligibility criteria

Complete the table with definitions used in the article:

	Inclusion criteria	Exclusion criteria
Age		
Sex		
Race		
Insurance		
Residency		
Hospitalization		
Availability of records		
Diagnosis (ICD code)		
Comorbidities		
Severity		
Acuity		
Other		

Patients

☐ Medical % of the sample _____
☐ Surgical % of the sample _____
☐ Adults % of the sample _____
☐ Pediatric % of the sample _____
☐ combined _____

Sample characteristics:

Complete with values reported in the article and with page number in the article where the data was extracted:

	Page in the article	**Exposure categories**	
Exposure :			
# Subjects			
Mean age			
Sex			
% of males			
Not reported			
Race (%)			
White			
Black			
Asian			
Other			
Not reported			
Ethnicity(%)			
Hispanic			
Not Hispanic			
Other			
Not reported			
Socioeconomic status (Scores)			
Not reported			
Primary diagnosis			
% ICD codes			
Co morbidities (case-mix index)			
Severity			
Acuity			
DRG			

Nurse characteristics.

Nurse eligibility criteria

Complete the table with definitions used in the article:

	Inclusion criteria	Exclusion criteria
Age		
License		
Experience		
Gender		
Working status		
Self-selection		
Other		

Nurses sample characteristics:

Complete with values reported in the article and with page number in the article where the data was extracted:

	Page in the article	Exposure categories	
Exposure :			
Mean age			
Gender			
% of males			
Not reported			
Race (%)			
White			
Black			
Asian			
Other			
Not reported			
Ethnicity (%)			
Hispanic			
Not Hispanic			
Other			
Not reported			
Foreign graduates %			
Not reported			

Organization characteristics which may impact patient outcomes.

Hospital eligibility criteria
Complete the table with definitions used in the article:

	Inclusion criteria	Exclusion criteria
Data source		
Location		
Size		
Care		
Teaching status		
Ownership		
Availability of information		
Self-selection		
Other		

Status of selected hospital(s)
☐ Number of eligible hospitals
☐ Number of enrolled hospitals
☐ Number of analyzed hospitals

if more than 1:
☐ Teaching, % of the sample _____
☐ Not teaching, % of the sample _____
☐ Combined sample
Location _____
Size (number of beds) _____
Ownership
☐ profit, % of the sample _____
☐ non profit, % of the sample _____
☐ public, % of the sample _____
☐ private, % of the sample _____
Technology index _____
☐ not reported
Computerization of communication and records _____
☐ not reported
Central hospital support adequacy _____
☐ not reported
HMO penetrating _____
☐ not reported

Clinical units
☐ Intensive care unit
☐ Labor and delivery
☐ Pre-natal
☐ Post-natal
☐ Nursery
☐ Emergency
☐ Trauma
☐ Critical care
☐ Visits
☐ Hospital general
☐ Medical
☐ Surgical
☐ Operating room
☐ Pediatric

☐ Post-anesthesia
☐ Psychiatry
☐ Specialty
☐ Step down units
☐ Telemetry
☐ Combined
☐ Unknown

Data extraction tables.

/*Complete with values reported in the article with the page number in the articles the data was extracted for a quality control*/
/*Add as many lines for categories as necessary*/
/*Median is calculated when ranges only reported assuming normal distribution*/
/* Increment is analyzed when regression coefficients only reported*/

Staffing variables:

Variable	Categories defined by authors	Mean	STD	95%CL	Median	Page number
Proportion of part time nurses, in%						
Proportion of registered nurses, in %						
Proportion of nurses with BS, in %						
Proportion of nurses with MS, in %						
Duration of shift in hours						

Patient outcomes.

/*Add lines for interactions Exposure*Interaction factor*/

Outcomes	Exposure categories (treatment groups)	Rate in %			Rate in %	Events	Subjects	Page
		Mean	STD	95%CL	Median			
Mortality								
Adverse events								
Adverse events								
Nurse quality outcomes								
Urinary tract infection								
Falls								
Injury								
Pressure ulcers								
Any complication								
Any Medical complication								

Any surgical complication								
Nosocomial infections								
Sepsis								
Surgical wound infection								
Postoperative complications								
Gastrointestinal bleeding								
Post surgical bleeding								
Hospital-acquired pneumonia								
Atelectasis or pulmonal failure								
Accidental extubation								
Post surgical Thrombosis								
Cardio-pulmonary arrest								
Failure to rescue								
Shock								

Outcomes	**Exposure categories**	**Relative Risk (RR)**	**Lower 95%CL of RR**	**Upper 95%CL of RR**		**Page**
Mortality						
Adverse events						
Nurse quality outcomes						
Falls						
Injury						
Pressure ulcers						
Urinary tract infection						
Any complication						
Any Medical complication						
Any surgical complication						
Nosocomial infections						
Sepsis						
Surgical wound infection						
Postoperative complications						
Gastrointestinal bleeding						
Post surgical bleeding						
Hospital-acquired pneumonia						
Atelectasis or pulmonal failure						
Accidental extubation						
Post surgical Thrombosis						
Cardio-pulmonary arrest						
Failure to rescue						
Shock						

Patient Satisfaction

Outcomes	Exposure	Exposure categories (treatment groups)	Mean	STD	95%CL	Median	Page
Satisfaction with nurse care							
Satisfaction with pain management							

ASSESSMENT OF STUDY QUALITY

OBSERVATIONAL STUDIES (*based on "Systems to Rate the Strength of Scientific Evidence, AHRQ Publication No. 02-E016, April 2002*)

Score each domain on a scale of 0 (poor, not defined) to 5 (excellent, clearly defined)

Observational Studies Quality Domains/Elements	**Score**
Study question clearly focused and appropriate ***Notes:***	
Sampling of Study Population Random Convenient Self-selected ***Notes:***	
Clear definition of exposure ***Notes:***	
Primary/secondary outcomes defined ***Notes:***	
Statistical Analysis: Assessment of confounding attempted Did the analysis adjust for or examine the effects of various factors Patient characteristics Hospital characteristics Cluster of patients and hospitals ***Notes:***	
Statistical methods used to take into account the effect of more than one variable on the outcome such as multiple regression, multivariate analysis, regression modeling -*see methods in paper* ***Notes:***	
Measure of effect for outcomes and appropriate measure of precision (SE, 95%CL) ***Notes:***	
Conclusions supported by results with possible bias and limitations taken into consideration ***Notes:***	
Single versus Multi-site study (*note one of the other*) ***Notes:***	
Co morbidities mentioned ***Notes****:*	
Co morbidities incorporated in the analyses ***Notes:***	
Total score	

INTERVENTIONAL STUDIES.

Intervention Studies Quality Domains/Elements	**Score**
Study question clearly focused and appropriate ***Notes:***	
Sampling of Study Population Random Convenient Self-selected ***Notes:***	
Clear definition of exposure ***Notes:***	
Randomization used to allocate patients (units) into treatment groups ***Notes:***	
Randomization allocation concealment method **Clearly adequate:** Centralized randomization by telephone, randomization scheme controlled by pharmacy, numbered or coded identical containers administered sequentially, on site computer system which can only be accessed after entering the characteristics of an enrolled participant, sequentially numbered sealed opaque envelopes. **Clearly Inadequate:** Alternation (consequent, odd-even, etc.), date of birth, date of week	
Sample size Justification of the sample size for each tested hypothesis	
Statistical Analysis: Assessment of adequacy of randomization - distribution of confounding factors at baseline in treatment groups: Patient characteristics Hospital characteristics Cluster of patients and hospitals ***Notes:***	
Intention to treat analysis. All eligible patients (units) included into analysis. ***Notes:***	
For each primary and secondary outcome, a summary of results for each group, and the estimated effect size and its precision (SE, 95% confidence interval). ***Notes:***	
Conclusions supported by results with clinical significance of effect size ***Notes:***	
Single versus Multi-site study (*note one of the other*) ***Notes:***	
Total score	

Study design characteristics

Adequacy of the sampling (random selection or not) (*check one*)

☐ random sampling
☐ convenience sampling
☐ non-random sampling
☐ single hospital study
☐ self-selected
☐ not specified
☐ all sampled subjects were analyzed
☐ sampled subjects were excluded from the analysis_____%

95% CL as reported estimates of the association between exposure and outcomes

☐ Yes ☐ No

P value as reported estimates of the association between exposure and outcomes

☐ Yes ☐ No

Correlation coefficient reported between exposure and outcomes

☐ Yes ☐ No

Propensity scores used for nonrandom unequal distribution of confounding factors among treatment groups

☐ Yes ☐ No

Adjustment for confounding factors:

Adjustment for age of the patients

☐ Yes ☐ No

Adjustment for race of the patients

☐ Yes ☐ No

Adjustment for patient sex

☐ Yes ☐ No

Adjustment for patient Diagnoses/comorbidities

☐ Yes ☐ No

Adjustment for socioeconomic status of the patients

☐ Yes ☐ No

Adjustment for hospital (provider) characteristics

☐ Yes ☐ No

Country
☐ Canada
☐ State or province abbreviation
☐ Combined

Sampling units (can be more than one)
☐ patients †
☐ hospitals
☐ hospital units
☐ nurses
☐ other (define)_____

Analytic unit (can be more than one)
☐ patients
☐ hospitals †-
☐ hospital units †-
☐ nurses

Level of evidence of the individual study (check one)

Interventions:
☐ I – Well-designed randomized controlled trial
☐ II-1A - Well-designed controlled trial with pseudo-randomization
☐ I-1B - Well-designed controlled trial without randomization

Observational studies

☐ I-2A - Well-designed cohort (prospective) study with concurrent controls
☐ I-2B - Well-designed cohort (prospective) study with historical controls
☐ II-2C - Well-designed cohort (retrospective) study with concurrent controls
☐ II-3 – Well-designed case-controlled (retrospective) study
☐ III – Large differences from comparisons between times and/or places
☐ IY – Opinion of respected authorities based in clinical experience

Appendix E: Quality of the Studies

Table E1 shows the quality of the studies, using a 5 score scale from 0 (poorest) to 5 (highest):

A. Study question clearly focused and appropriate
B. Clear definition of exposure
C. Clear definition of the primary and secondary outcomes
D. Validation of exposure (yes or no, the responses do not count for the total scores)
E. Validation of outcomes (yes or no, the responses do not count for the total scores)
F. Sampling of study population:
   5 = Random population based sampling
   4 = Random clinic based sampling
   3 = Convenient
   2 = Self-selected
   1 = Single hospital study
   0 = Not specified
G. Statistical Analysis: Assessment of confounding attempted
H. Adjustment to examine the effects of various factors
   1) Patient characteristics: age; race; sex; comorbidities; SES - 1-3 scores
   2) Hospital characteristics – 1+2 - 4 scores
   3) Cluster of patients and hospitals - 1+2+3 - 5 scores
I. Statistical methods used to take into account the effect of more than one variable on the outcome such as multiple regression, multivariate analysis, regression modeling
J. Measure of effect for outcomes and appropriate measure of precision (SE, 95% CI)
K. External validity: single hospital study; multi-site study; nationally representative sample
L. Conclusions supported by results with possible bias and limitations taken into consideration; clinical significance of effect size provided
M. Total score as a percentage of the maximum possible (50)

Each item was graded with 0 to 5 scores. We summarized scores (maximum possible 50) to have the overall quality score and to compare with the maximum.

Definitions

External validity – applicability of the results from the studies on different clinical settings.

Internal validity – the extent to which the findings of a study accurately represent the causal relationship between nurse staffing and patient outcomes. The truth why patients had different outcomes may be related to patient characteristics or quality of the treatments (surgical quality) more than nurse care. To examine how nurse ratios and hours may affect patient outcomes independent of all known factors they measured, the authors adjusted the results for confounding factors.

Table E1. Quality of the studies

Year	Author	Class	A	B	C	D	E	F	G	H	I	J	K	L	Total Score	M %
1982	Arnow[1]	II-2C	5	4	5	Yes	Yes	5	3	0	3	2	2	4	33	66
1987	Wan[2]	II-2C	5	4	4			3	4	2	4	4	4	4	38	76
1988	Flood[3]	III	4	4	4			1	3	1	3	3	2	3	28	56
1989	Hartz[4]	III	5	3	4			3	3	3	3	3	4	3	34	68
1992	McDaniel[5]	III	4	4	5			4	3	0	2	2	2	3	29	58
1992	Krakauer[6]	III	5	3	4			5	5	5	4	5	5	4	45	90
1993	Halpine[7]	III	5	4	5			3	3	2	3	3	3	4	35	70
1994	Aiken[8]	II-2B	5	4	5			4	5	5	4	5	4	4	45	90
1994	Shamian[9]	III	4	3	3			3	3	2	3	3	4	4	32	64
1994	Taunton[10]	III	5	4	4			2	3	0	2	3	3	4	30	60
1988	Shortell[11]	II-2C	5	3	4			5	4	4	4	4	5	4	42	84
1994	Shortell[12]	II-2C	5	4	4			4	3	3	3	4	4	4	38	76
1995	Grillo-Peck[13]	III	5	5	4			3	2	1	3	2	3	3	31	62
1995	Thorson[14]	II-2C	5	5	4			4	4	4	4	4	4	5	43	86
1996	Fridkin[15]	II-2C	5	4	5		Yes	4	5	4	5	4	3	4	43	86
1996	Dugan[16]	III	3	3	4			2	0	0	3	2	2	3	22	44
1997	Bloom[17]	III	4	4	5			4	3	3	4	4	5	4	40	80
1997	Archibald[18]	II-2C	5	4	5		Yes	3	3	2	3	3	2	4	34	68
1997	Minnick[19]	III	3	3	3			4	3	2	4	4	4	4	34	68
1997	Melberg[20]	III	0	4	5			3	0	0	2	2	3	3	22	44
1997	ANA[21]	II-2C	5	4	4			3	3	4	3	4	4	4	38	76
1998	Blegen[22]	II-2C	5	4	4			3	3	3	4	2	4	4	36	72
1998	Blegen[23]	II-2C	5	4	5			3	4	3	4	4	3	4	39	78
1998	Kovner[24]	III	5	4	4			4	4	4	4	4	4	4	41	82
1998	Leiter[25]	III	4	4	4			2	3	0	3	3	3	4	30	60
1998	Aiken[26]	II-2C	5	3	5		Yes	3	5	4	4	5	4	4	42	84
1999	Pronovost[27]	II-2C	5	3	5			2	5	5	5	5	4	5	44	88
1999	Aiken[28]	II-2C	5	3	5		Yes	3	5	4	4	5	4	4	42	84
1999	Robertson[29]	II-2C	5	4	5			3	4	4	4	4	4	4	41	82
1999	Lichtig[30]	II-2C	5	4	4			3	4	4	3	4	3	4	38	76
1999	Seago[31]	III	4	4	3			3	0	0	3	3	3	4	27	54
1999	Bond[32]	II-2C	5	4	4			5	4	4	5	5	5	4	45	90
2000	Amaravadi[33]	II-2C	5	4	5		Yes	2	5	5	5	5	4	5	45	90
2000	Gandjour[34]	III	3	3	5			3	4	3	3	4	3	4	35	70
2000	Robert[35]	II-2C	5	5	5	Yes	Yes	4	4	2	5	4	3	5	42	84
2000	Silber[36]	II-2C	5	4	5			5	4	5	5	5	5	4	47	94
2000	ANA[37]	II-2C	5	3	4			5	3	3	4	3	5	4	39	78
2000	Hoover[38]	III	5	4	5			3	4	4	3	3	3	4	38	76
2000	Unruh[39]	II-2C	5	4	4			3	4	4	3	4	4	4	39	78
2001	Pronovost[40]	II-2C	5	4	5			3	5	4	5	5	4	5	45	90
2001	Dimick[41]	II-2C	5	4	5			2	5	4	4	5	4	5	43	86

Table E1. Quality of the studies (continued)

Year	Author	Class	A	B	C	D	E	F	G	H	I	J	K	L	Total Score	M %
2001	Blegen[42]	II-2C	4	3	3			3	4	3	4	4	4	4	36	72
2001	Needleman[43]	III	5	5	5			4	5	4	4	5	5	5	47	94
2001	Bolton[44]	III	5	4	4			3	3	2	2	2	4	4	33	66
2001	Aiken[45]	III	4	3	3			3	3	0	2	2	3	4	27	54
2001	Whitman[46]	II-2A	4	4	5			3	2	2	3	3	3	4	33	66
2001	Sovie[47]	II-2C	5	4	4			3	3	2	3	3	3	4	34	68
2001	Ridge[48]	III	5	5	4			4	3	3	3	3	2	4	36	72
2001	Ritter-Teitel[49]	II-2C	5	4	4			5	4	4	4	4	5	5	44	88
2002	Dang[50]	II-2C	5	4	5			3	4	4	5	5	4	5	44	88
2002	Aiken[51]	II-2C	5	3	5		Yes	3	5	5	5	4	4	4	43	86
2002	Seago[52]	III	5	4	5		Yes	3	4	4	4	4	3	4	40	80
2002	Tourangeau[53]	II-2C	5	4	5	Yes	Yes	3	5	4	4	4	5	5	44	88
2002	Kovner[54]	III	5	4	4			5	4	4	4	5	4	5	44	88
2002	Langemo[55]	III	5	3	4			3	3	0	2	0	3	3	26	52
2002	Needleman[56]	III	5	4	4			3	5	4	5	5	5	5	45	90
2002	Barkell[57]	III	5	4	5		Yes	3	2	0	2	2	1	3	27	54
2002	Stegenga[58]	II-2C	5	5	5	Yes	Yes	3	4	0	5	4	2	4	37	74
2002	Whitman[59]	III	5	4	4			3	3	0	3	2	3	3	30	60
2002	Cheung[60]	III	3	5	5	Yes	Yes	3	3	2	2	3	2	3	31	62
2002	Oster[61]	III	5	5	5			3	4	3	4	3	3	3	38	76
2003	Aiken[62]	III	5	4	5		Yes	4	5	5	5	5	4	5	47	94
2003	Beckman[63]	III	5	5	5	Yes	Yes	4	4	4	3	3	2	3	38	76
2003	Berney[64]	II-2C	5	5	5		Yes	3	5	5	4	5	4	5	46	92
2003	Unruh[65]	II-2C	5	5	5			3	4	4	4	4	4	5	43	86
2003	Cho[66,67]	II-2C	4	4	4		Yes	3	5	4	5	5	4	5	43	86
2003	Langemo[68]	III	4	3	3			3	2	0	2	2	2	3	24	48
2003	Needleman[69]	III	5	4	4			4	4	4	4	4	5	4	42	84
2003	Mark[70]	II-1B	5	3	4			3	2	1	3	2	3	4	30	60
2003	Alonso-Echanove[71]	II-2A	5	5	5	Yes	Yes	4	4	4	5	4	4	5	45	90
2003	Bolton[72]	III	5	4	4			3	2	1	2	3	4	3	31	62
2003	Potter[73]	III	4	4	5			3	3	2	3	3	2	4	33	66
2003	Hope[74]	II-2C	5	5	5	Yes	Yes	3	5	4	5	5	3	5	45	90
2003	Simmonds[75]	II-2C	5	4	5			3	4	3	4	4	2	3	37	74
2003	Zidek[76]	II-2C	5	4	4			3	3	3	3	3	3	3	34	68
2003	Tallier[77]	II-2C	4	4	4			3	2	0	3	1	2	3	26	52
2004	Person[78]	II-2C	5	4	5			5	5	5	5	5	5	5	49	98
2004	Sochalski[79]	III	5	3	3			5	3	2	4	3	4	3	35	70
2004	Mark[80]	II-2C	5	4	4			4	4	4	5	5	4	5	44	88
2004	Van Doren[81]	III	4	5	5			4	2	0	3	2	3	4	32	64
2004	Vahey[82]	III	5	3	4			3	4	4	5	5	3	4	40	80
2004	Boyle[83]	III	3	3	4			3	3	2	3	3	2	3	29	58
2004	Cimiotti[84]	II-2C	5	4	4			3	4	4	4	4	3	4	39	78
2005	Estabrooks[85]	III	5	3	5	Yes	Yes	3	4	4	5	5	4	4	42	84

Table E1. Quality of the studies (continued)

Year	Author	Class	A	B	C	D	E	F	G	H	I	J	K	L	Total Score	M %
2005	Marcin[86]	II-2C	5	5	5	Yes	Yes	3	4	4	5	5	3	4	43	86
2005	Elting[87]	II-2C	5	3	5			3	5	5	5	5	4	4	44	88
2005	Mark[88]	II-2C	5	4	4			4	4	4	4	4	4	5	42	84
2004	Donaldson[89]	III	5	4	3			3	3	2	4	3	4	4	35	70
2005	Tschannen[90]	III	5	5	5	Yes	Yes	3	5	4	4	4	2	3	40	80
2005	Houser[91]	III	5	4	5			5	4	4	4	4	5	5	45	90
2005	Halm[92]	III	5	5	5			3	3	3	4	4	2	4	38	76
2005	Donaldson[93]	III	5	5	4			3	4	5	4	5	4	4	43	86
2005	Stratton[94]	II-2C	5	4	4			3	4	4	3	3	4	4	38	76
2006	Seago[95]	II-2C	5	4	5			3	3	2	3	3	3	3	34	68

Figure E1 plots the quality scores (expressed as the percent of maximum possible scores) over time to look for changes in ratings. Although there is a modestly positive overall trend, it is not significant.

Figure E1. Association between quality of studies and time of publication

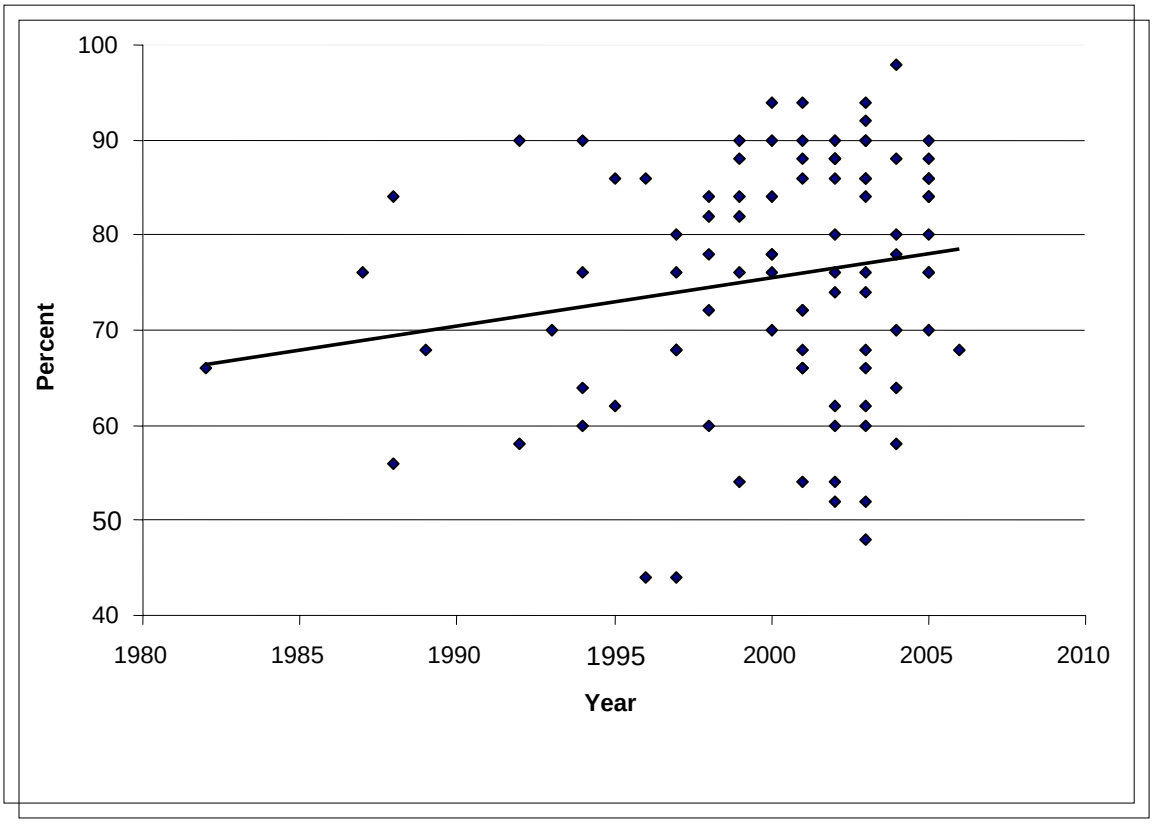

Table E2. Studies published in peer reviewed journals indexed in Medline

Source*	Number of Publications	Quality (% from maximum)
Am J Crit Care	1	86
Anesthesiology	1	94
book	2	77
Can J Nurs Res	1	88
Cancer	1	88
Clin Nurse Spec	1	76
Dissertation	15	77
Eff Clin Pract	1	90
Health Econ	1	84
Health Serv Manage Res	1	82
Health Serv Res	4	88
Heart Lung	1	88
Image J Nurs Sch	1	82
Infect Control Hosp Epidemiol	4	84
Intensive Care Med	1	90
J Health Hum Serv Adm	1	54
J Nurs Adm	12	65
J Nurs Care Qual	1	44
J Nurs Scholarsh	1	66
J Trauma	1	66
JAMA	3	89
Lippincotts Case Manag	1	64
Manag Care Interface	1	70
Med Care	8	82
N Engl J Med	3	81
Nurs Adm Q	1	
Nurs Econ	4	65
Nurs Manage	3	49
Nurs Res	4	79
Outcomes Manag	1	54
Pediatr Crit Care Med	1	86
Pediatr Infect Dis J	1	68
Pharmacotherapy	1	90
Phys Rev B Condens Matter	1	76
Phys Rev C Nucl Phys	1	78
Policy Polit Nurs Pract	1	70
QRB Qual Rev Bull	1	76
Qual Health C	1	84
Report	1	94
Report	1	86
Soc Sci Med	2	64

*Title abbreviations from the National Library of Medicine

Table E3. Assessment of patient comorbidities in included studies

Author	Source to Measure Patient Outcomes	Assessment of Comorbid Conditions Analytic Unit
Aiken	Medical charts of consecutively admitted patients	Severity classification for AIDS hospitalization, clinical AIDS Prognostic Staging Analytic unit: Patient
Aiken	Hospitals discharge database	ICD codes for pre-existing comorbid conditions Analytic unit: Patient
Aiken	Health Care Cost Containment Council	ICD codes for pre-existing co morbid conditions Analytic unit :Patient
Aiken	HCFA database	Medicare Case Mix Index Analytic unit: Hospital
Aiken	Patients survey	HIV risk categories, illness severity Analytic unit: Patient
Alonso-Echanove	Medical charts	Secondary diagnoses and individual medical history present at the time of the admission Analytic unit: Patient
Amaravadi	Uniform Hospital Health Discharge Data Set	ICD codes for comorbid conditions (secondary diagnoses and procedures) Analytic unit: Patient
ANA	HCFA discharges database	Patients' case mix index and severity of Illness index Analytic unit: Hospital
ANA	Uniform Hospital Discharge Data Set	Patient case mix index and severity of Illness index Analytic unit: Hospital
Berney	New York Statewide Planning and Research Cooperative System	DRG codes for comorbid conditions Analytic unit: Hospital
Blegen	Comparative occurrence reporting service (CORS)	Hospital Medicare Case Mix Scores Analytic unit: Hospital Unit
Blegen	Hospitals discharge database	Hospital Medicare Case Mix Index Analytic unit: Hospital Unit
Blegen	Hospital discharge records	Patient's acuity data from the monthly acuity system reports Analytic unit: Hospital Unit
Bloom	Transaction Cost Analysis; Area Resource File	Medicare Case Mix Index Analytic unit: Hospital
Bond	Hospital Medicare mortality rates from the Health Care Financing Administration	Medicare case mix, APACHE scores, Severity of Illness scores Analytic unit: Hospital
Boyle	Hospital discharge data	Patients case mix index Analytic unit: Patient
Cho	State inpatient databases	DRG codes to calculate the number of diagnoses at admission Analytic unit: Patient and hospitals
Cimiotti	Patient discharges and medical records reviewed by study's nurse epidemiologist	DRG for comorbid conditions and procedures Analytic unit: Patient
Dang	Uniform Hospital Health Discharge Data Set	ICD codes for comorbid conditions (secondary diagnoses and procedures) Analytic unit: Patient
Dimick	Uniform Health Discharge Data Set	ICD codes for comorbid conditions (secondary diagnoses and procedures) Analytic unit: Patient
Elting	Center for Medicare and Medicaid Services and the American Hospital Association	Comorbid conditions were coded using the Dartmouth Manitoba Adaptation of Charlson comorbidity score Analytic unit: Hospital
Estabrooks	Hospital inpatient database	Charlson index modified by Devo Analytic unit: Patient

Table E3. Assessment of patient comorbidities in included studies (continued)

Author	Source to Measure Patient Outcomes	Assessment of Comorbid Conditions Analytic Unit
Fridkin	Medical records	Severity of illness with APACHE II scores Analytic unit: Patient
Gandjour	Health Care Financing Administration	Medicare case-mix Analytic unit: Hospital
Halm	Hospital's data warehouse with patient discharges	DRGs codes for comorbid conditions Analytic unit: Patient
Halpine	Hospital Medical Records Institute database	Case Mix Groups Analytic unit: Patient
Hartz	Hospital discharges data from The Health Care Financing Administration (HCFA)	ICD codes for 4 secondary diagnoses, Severity of Illness index Analytic unit: Hospital
Hoover	Health Care Financing Administration, HealthCareReportCards.com; MEDPAR database	Medicare Case Mix Index Analytic unit: Hospital
Hope	Medical Microbiology Laboratory and Infection Control Services; Discharge Abstract Database	Patient severity of Illness index Analytic unit: Patient
Houser	Nationwide inpatient sample of 2001 with hospital discharge records	ICD codes for comorbid conditions Analytic unit: Patient
Kovner	National Inpatient Sample (NIS)	Medicare Case Mix Index Analytic unit: Hospital
Kovner	Nationwide inpatient sample of hospital discharges	Medicare Case Mix Index Analytic unit: Hospital
Krakauer	Medical records for all Medicare discharges	ICD codes for 4 comorbid conditions and additional clinical data with MediQual system Analytic unit: Hospital
Marcin	Medical charts, Pediatric Intensive Care Unit Evaluations Database	Pediatric Risk of Mortality (PRISM) III index Analytic unit: Patient
Mark	Centers for Medicare Services Minimum Cost and Capital File, CMS Provider of Services File, CMS Case Mix Index File, CMS Online Survey Certification and Reporting system (OSCAR) files, and HCUP files	CMS Case Mix Index Analytic unit: Hospital
Mark	Hospital's incident reporting system	CMS Case Mix Index File Analytic unit: Patient (survey)
Mark	Healthcare Cost and Utilization Project (HCUP) National Inpatient Sample (NIS)	CMS case mix index file, Medstat's Disease Staging methodology Analytic unit: Hospital
Needleman	Hospital discharge data from 11 states (all patients and Medicare sample) and MedPAR national database (all Medicare patients)	DRGs codes for comorbid conditions Analytic unit: Hospital and units
Person	Medicare database	Patients severity of illness index Analytic unit :Patient
Pronovost	Uniform Hospital Health Discharge Data Set	ICD codes for comorbid conditions Analytic unit: Patient
Pronovost	Uniform Hospital Health Discharge Data Set	ICD codes for comorbid conditions (secondary diagnoses and procedures) Analytic unit: Patient
Ridge	Patient survey 2 weeks after discharge with computerized phone interview system	Medicare case mix Analytic unit: Patient
Ritter-Teitel	Hospitals Incidence reports and patient surveys	Patients case mix index Analytic unit: Unit
Robert	Medical charts	Severity of illness with APACHE II scores Analytic unit: Patient
Robertson	HCFA database and Hospitals Information Reports	Medicare Case Mix Index Analytic unit: Hospital
Seago	California Office of Statewide Health Planning and Development (OSHPD) Hospital Disclosure Report database	Patients severity of illness index Analytic unit: Hospital

Table E3. Assessment of patient comorbidities in included studies (continued)

Author	Source to Measure Patient Outcomes	Assessment of Comorbid Conditions Analytic Unit
Seago	Incident reporting system, patient survey	Case-mix index Analytic unit: Patient
Shamian	National Comparative Database for Nursing Resource Consumption	ICD codes for secondary diagnoses present at admission Analytic unit: Unit
Shortell	MedPAR dataset of hospital discharges	Medicare case mix Analytic unit: Hospital
Shortell	Hospitals discharge data	DRG codes for comorbid conditions, APACHE III scores Analytic unit: Unit
Silber	Pennsylvania Medicare claims records; Medicare Standard Analytic Files; random sample of 50% of Medicare patients who underwent general surgical or orthopedic procedures	ICD codes for comorbid conditions present at admission and physician's current procedural terminology for outpatient visits within 3 months before index hospital stay Analytic unit: Hospital
Tourangeau	Ontario Acute Care Hospitals Dataset	DCID codes for pre-existing comorbid conditions (Manitoba adaptation of the Charlson index) Analytic unit: Hospital
Tschannen	Patient medical records	Patient Acuity Index, ICD codes for comorbid conditions Analytic unit: Patient
Unruh	Pennsylvania Health Care Cost Containment Council	MediQual severity measure to calculate scores Analytic unit: Hospital
Unruh	State Health Care Cost Containment Council	MediQual severity scores Analytic unit: Patient
Wan	Hospital records	Patient Acuity Index Analytic unit: Hospital
Zidek	Hospital discharge data, patient records, and chart audits	Patients severity of illness index Analytic unit: Patient

References

1. Arnow P, Allyn PA, Nichols EM, et al. Control of methicillin-resistant Staphylococcus aureus in a burn unit: role of nurse staffing. J Trauma. Nov 1982; 22(11):954-9.
2. Wan TT, Shukla RK. Contextual and organizational correlates of the quality of hospital nursing care. Qual Rev Bull. Feb 1987; 13(2):61-4.
3. Flood SD, Diers D. Nurse staffing, patient outcome and cost. Nurs Manage. May 1988; 19(5):34-5, 8-9, 42-3.
4. Hartz AJ, Krakauer H, Kuhn EM, et al. Hospital characteristics and mortality rates. N Engl J Med. Dec 21 1989; 321(25):1720-5.
5. McDaniel C, Patrick T. Leadership, nurses, and patient satisfaction: a pilot study. Nurs Adm Q. Spring 1992; 16(3):72-4.
6. Krakauer H, Bailey RC, Skellan KJ, et al. Evaluation of the HCFA model for the analysis of mortality following hospitalization. Health Serv Res. Aug 1992; 27(3):317-35.
7. Halpine S, Maloney S. Tracing the missing link between nursing workload and case mix groups: a validation study. Health Manage Forum. Fall 1993; 6(3):19-26.
8. Aiken LH, Smith HL, Lake ET. Lower Medicare mortality among a set of hospitals known for good nursing care. Med Care. Aug 1994; 32(8):771-87.
9. Shamian J, Hagen B, Hu TW, et al. The relationship between length of stay and required nursing care hours. J Nurs Adm. Jul-Aug 1994; 24(7-8):52-8.
10. Taunton RL, Kleinbeck SV, Stafford R, et al. Patient outcomes. Are they linked to registered nurse absenteeism, separation, or work load? J Nurs Adm. Apr 1994; 24(4 Suppl):48-55.
11. Shortell SM, Hughes EF. The effects of regulation, competition, and ownership on mortality rates among hospital inpatients. N Engl J Med. Apr 28 1988; 318(17):1100-7.
12. Shortell SM, Zimmerman JE, Rousseau DM, et al. The performance of intensive care units: does good management make a difference? Med Care. May 1994; 32(5):508-25.
13. Grillo-Peck AM, Risner PB. The effect of a partnership model on quality and length of stay. Nurs Econ. Nov-Dec 1995; 13(6):367-72, 74.
14. Thorson MJ. Hours of nursing care: Relationship to patient outcomes. Dissertation. 1995; DAI-B 57/02, p. 992, Aug 1996:AAT 9616239.
15. Fridkin SK, Pear SM, Williamson TH, et al. The role of understaffing in central venous catheter-associated bloodstream infections. Infect Control Hosp Epidemiol. Mar 1996; 17(3):150-8.
16. Dugan J, Lauer E, Bouquot Z, et al. Stressful nurses: the effect on patient outcomes. J Nurs Care Qual. Apr 1996; 10(3):46-58.
17. Bloom JR, Alexander JA, Nuchols BA. Nurse staffing patterns and hospital efficiency in the United States. Soc Sci Med. Jan 1997; 44(2):147-55.
18. Archibald LK, Manning ML, Bell LM, et al. Patient density, nurse-to-patient ratio and nosocomial infection risk in a pediatric cardiac intensive care unit. Pediatr Infect Dis J. Nov 1997; 16(11):1045-8.
19. Minnick AF, Roberts MJ, Young WB, et al. What influences patients' reports of three aspects of hospital services? Med Care. Apr 1997; 35(4):399-409.
20. Melberg SE. Effects of changing skill mix. Nurs Manage. Nov 1997; 28(11):47-8.
21. ANA. Implementing Nursing's Report Card. A Study of RN Staffing, Length of Stay and Patient Outcomes. The American Nurses Association. 1997; American Nurses Publishing, Washington DC, 1997.:ISBN 1558101349.
22. Blegen MA, Goode CJ, Reed L. Nurse staffing and patient outcomes. Nurs Res. Jan-Feb 1998; 47(1):43-50.
23. Blegen MA, Vaughn T. A multisite study of nurse staffing and patient occurrences. Nurs Econ. Jul-Aug 1998; 16(4):196-203.
24. Kovner C, Gergen PJ. Nurse staffing levels and adverse events following surgery in U.S. hospitals. Image J Nurs Sch. 1998; 30(4):315-21.
25. Leiter MP, Harvie P, Frizzell C. The correspondence of patient satisfaction and nurse burnout. Soc Sci Med. Nov 1998; 47(10):1611-7.
26. Aiken LH, Sloane DM, Sochalski J. Hospital organisation and outcomes. Qual Health Care. Dec 1998; 7(4):222-6.
27. Pronovost PJ, Jenckes MW, Dorman T, et al. Organizational characteristics of intensive care units related to outcomes of abdominal aortic surgery. JAMA. Apr 14 1999; 281(14):1310-7.
28. Aiken LH, Sloane DM, Lake ET, et al. Organization and outcomes of inpatient AIDS care. Med Care. Aug 1999; 37(8):760-72.
29. Robertson RH, Hassan M. Staffing intensity, skill mix and mortality outcomes: the case of chronic obstructive lung disease. Health Serv Manage Res. Nov 1999; 12(4):258-68.
30. Lichtig LK, Knauf RA, Milholland DK. Some impacts of nursing on acute care hospital outcomes. J Nurs Adm. Feb 1999; 29(2):25-33.
31. Seago JA. Evaluation of a hospital work redesign: patient-focused care. J Nurs Adm. Nov 1999; 29(11):31-8.
32. Bond CA, Raehl CL, Pitterle ME, et al. Health care professional staffing, hospital characteristics, and hospital mortality rates. Pharmacotherapy. Feb 1999; 19(2):130-8.
33. Amaravadi RK, Dimick JB, Pronovost PJ, et al. ICU nurse-to-patient ratio is associated with complications and resource use after esophagectomy. Intensive Care Med. Dec 2000; 26(12):1857-62.
34. Gandjour A. The effect of managed care penetration on hospital staffing in Tennessee, 1991-1995. Manag Care Interface. Sep 2000; 13(9):62-6, 70.

35. Robert J, Fridkin SK, Blumberg HM, et al. The influence of the composition of the nursing staff on primary bloodstream infection rates in a surgical intensive care unit. Infect Control Hosp Epidemiol. Jan 2000; 21(1):12-7.
36. Silber JH, Kennedy SK, Even-Shoshan O, et al. Anesthesiologist direction and patient outcomes. Anesthesiology. Jul 2000; 93(1):152-63.
37. ANA. Nurse Staffing and Patient Outcomes: In the Inpatient Hospital Setting. American Nurses Publishing, Washington DC, 1997. 2000:1558101519.
38. Hoover KW. The impact of managed care penetration, hospital organizational variables and nurse staffing on hospital patient outcomes. Dissertation. 2000; DAI-B 61/08, p. 4062, Feb 2001:AAT 9984608.
39. Unruh LY. The impact of hospital nurse staffing on the quality of patient care. Dissertation. 2000; DAI-A 61/04, p. 1543, Oct 2000:AAT 9969789.
40. Pronovost PJ, Dang D, Dorman T, et al. Intensive care unit nurse staffing and the risk for complications after abdominal aortic surgery. Eff Clin Pract. Sep-Oct 2001; 4(5):199-206.
41. Dimick JB, Swoboda SM, Pronovost PJ, et al. Effect of nurse-to-patient ratio in the intensive care unit on pulmonary complications and resource use after hepatectomy. Am J Crit Care. Nov 2001; 10(6):376-82.
42. Blegen MA, Vaughn TE, Goode CJ. Nurse experience and education: effect on quality of care. J Nurs Adm. Jan 2001; 31(1):33-9.
43. Needleman J. Nurse staffing and patient outcomes in hospitals. Final Report for Health Resources Services Administration. 2001; Contract No. 230990021.
44. Bolton LB, Jones D, Aydin CE, et al. A response to California's mandated nursing ratios. J Nurs Scholarsh. 2001; 33(2):179-84.
45. Aiken LH, Clarke SP, Sloane DM. Hospital restructuring: does it adversely affect care and outcomes? J Health Hum Serv Adm. Spring 2001; 23(4):416-42.
46. Whitman GR, Davidson LJ, Sereika SM, et al. Staffing and pattern of mechanical restraint use across a multiple hospital system. Nurs Res. Nov-Dec 2001; 50(6):356-62.
47. Sovie MD, Jawad AF. Hospital restructuring and its impact on outcomes: nursing staff regulations are premature. J Nurs Adm. Dec 2001; 31(12):588-600.
48. Ridge RA. The relationship between patient satisfaction with nursing care and nurse staffing. Dissertation. 2001; DAI-B 62/01, p. 165, Jul 2001:AAT 3000170.
49. Ritter-Teitel J. An exploratory study of a predictive model for nursing-sensitive patient outcomes derived from patient care unit structure and process variables. Dissertation. 2001; DAI-B 62/02, p. 785, Aug 2001:AAT 3003686.
50. Dang D, Johantgen ME, Pronovost PJ, et al. Postoperative complications: does intensive care unit staff nursing make a difference? Heart Lung. May-Jun 2002; 31(3):219-28.
51. Aiken LH, Clarke SP, Sloane DM, et al. Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. JAMA. Oct 23-30 2002; 288(16):1987-93.
52. Seago JA, Ash M. Registered nurse unions and patient outcomes. J Nurs Adm. Mar 2002; 32(3):143-51.
53. Tourangeau AE, Giovannetti P, Tu JV, et al. Nursing-related determinants of 30-day mortality for hospitalized patients. Can J Nurs Res. Mar 2002; 33(4):71-88.
54. Kovner C, Jones C, Zhan C, et al. Nurse staffing and postsurgical adverse events: an analysis of administrative data from a sample of U.S. hospitals, 1990-1996. Health Serv Res. Jun 2002; 37(3):611-29.
55. Langemo DK, Anderson J, Volden CM. Nursing quality outcome indicators. The North Dakota Study. J Nurs Adm. Feb 2002; 32(2):98-105.
56. Needleman J, Buerhaus P, Mattke S, et al. Nurse-staffing levels and the quality of care in hospitals. N Engl J Med. May 30 2002; 346(22):1715-22.
57. Barkell NP, Killinger KA, Schultz SD. The relationship between nurse staffing models and patient outcomes: a descriptive study. Outcomes Manag. Jan-Mar 2002; 6(1):27-33.
58. Stegenga J, Bell E, Matlow A. The role of nurse understaffing in nosocomial viral gastrointestinal infections on a general pediatrics ward. Infect Control Hosp Epidemiol. Mar 2002; 23(3):133-6.
59. Whitman GR, Kim Y, Davidson LJ, et al. The impact of staffing on patient outcomes across specialty units. J Nurs Adm. Dec 2002; 32(12):633-9.
60. Cheung RB. The relationship between nurse staffing, nursing time, and adverse events in an acute care hospital. Dissertation. 2002; DAI-B 63/05, p. 2301, Nov 2002:AAT 3052636.
61. Oster CAH. The relationships between emergency department staffing and clinical outcomes of the acute myocardial infarction patient. Dissertation. 2002; DAI-B 63/03, p. 1272, Sep 2002:AAT 3045751.
62. Aiken LH, Clarke SP, Cheung RB, et al. Educational levels of hospital nurses and surgical patient mortality. JAMA. Sep 24 2003; 290(12):1617-23.
63. Beckman JAS. The effectiveness of nursing practice patterns in acute care nursing sub-units. Dissertation. 2003; DAI-B 64/11, p. 5445, May 2004:AAT 3111973.
64. Berney BL. Use, trends, and impacts of nurse overtime in New York hospitals, 1995-2000. Dissertation. 2003; DAI-B 63/11, p. 5154, May 2003:AAT 3072377.
65. Unruh L. Licensed nurse staffing and adverse events in hospitals. Med Care. Jan 2003; 41(1):142-52.
66. Cho SH. Nurse staffing and adverse patient outcomes. Dissertation. 2002; DAI-B 63/02, p. 735, Aug 2002:AAT 3042055.
67. Cho SH, Ketefian S, Barkauskas VH, et al. The effects of nurse staffing on adverse events, morbidity, mortality, and medical costs. Nurs Res. Mar-Apr 2003; 52(2):71-9.
68. Langemo DK, Anderson J, Volden C. Uncovering pressure ulcer incidence. Nurs Manage. Oct 2003; 34(10):54-7.

69. Needleman J, Buerhaus PI, Mattke S, et al. Measuring hospital quality: can Medicare data substitute for all-payer data? Health Serv Res. Dec 2003; 38(6 Pt 1):1487-508.
70. Mark BA, Salyer J, Wan TT. Professional nursing practice: impact on organizational and patient outcomes. J Nurs Adm. Apr 2003; 33(4):224-34.
71. Alonso-Echanove J, Edwards JR, Richards MJ, et al. Effect of nurse staffing and antimicrobial-impregnated central venous catheters on the risk for bloodstream infections in intensive care units. Infect Control Hosp Epidemiol. Dec 2003; 24(12):916-25.
72. Bolton LB, Aydin CE, Donaldson N, et al. Nurse staffing and patient perceptions of nursing care. J Nurs Adm. Nov 2003; 33(11):607-14.
73. Potter P, Barr N, McSweeney M, et al. Identifying nurse staffing and patient outcome relationships: a guide for change in care delivery. Nurs Econ. Jul-Aug 2003; 21(4):158-66.
74. Hope J. Nosocomial infections and their relationship to nursing workload in an acute care hospital. Dissertation. 2003; MAI 42/04, p. 1241, Aug 2004:AAT MQ86117.
75. Simmonds KA. Nursing workload and its relationship to vancomycin-resistant enterococci colonization in chronic dialysis patients. Dissertation. 2004; MAI 43/02, p. 529, Apr 2005:AAT MQ93404.
76. Zidek CK. Assessment of nursing care quality and the judgment of the professional nurse as reflected in nurse-determined patient acuity classification and staffing decisions. Dissertation. 2003; DAI-B 64/02, p. 642, Aug 2003:AAT 3080441.
77. Tallier PC. Nurse staffing ratios and patient outcomes. Dissertation. 2003; DAI-B 64/05, p. 2133, Nov 2003:AAT 3091301.
78. Person SD, Allison JJ, Kiefe CI, et al. Nurse staffing and mortality for Medicare patients with acute myocardial infarction. Med Care. Jan 2004; 42(1):4-12.
79. Sochalski J. Is more better? the relationship between nurse staffing and the quality of nursing care in hospitals. Med Care. Feb 2004; 42(2 Suppl):II67-73.
80. Mark BA, Harless DW, McCue M, et al. A longitudinal examination of hospital registered nurse staffing and quality of care. Health Serv Res. Apr 2004; 39(2):279-300.
81. Van Doren ES, Bowman J, Landstrom GL, et al. Structure and process variables affecting outcomes for heart failure clients. Lippincotts Case Manag. Jan-Feb 2004; 9(1):21-6.
82. Vahey DC, Aiken LH, Sloane DM, et al. Nurse burnout and patient satisfaction. Med Care. Feb 2004; 42(2 Suppl):II57-66.
83. Boyle SM. Nursing unit characteristics and patient outcomes. Nurs Econ. May-Jun 2004; 22(3):111-9, 23, 07.
84. Cimiotti JP. Nurse staffing and healthcare-associated infections in the neonatal ICU. Dissertation. 2004; DAI-B 65/04, p. 1775, Oct 2004:AAT 3128935.
85. Estabrooks CA, Midodzi WK, Cummings GG, et al. The impact of hospital nursing characteristics on 30-day mortality. Nurs Res. Mar-Apr 2005; 54(2):74-84.
86. Marcin JP, Rutan E, Rapetti PM, et al. Nurse staffing and unplanned extubation in the pediatric intensive care unit. Pediatr Crit Care Med. May 2005; 6(3):254-7.
87. Elting LS, Pettaway C, Bekele BN, et al. Correlation between annual volume of cystectomy, professional staffing, and outcomes: a statewide, population-based study. Cancer. Sep 1 2005; 104(5):975-84.
88. Mark BA, Harless DW, McCue M. The impact of HMO penetration on the relationship between nurse staffing and quality. Health Econ. Jul 2005; 14(7):737-53.
89. Donaldson NE Brown DS, Bolton, LB et al. Unit Level Nurse Workload Impacts on Patient Safety. the Agency for Healthcare Research and Quality Working Conditions Grant Initiative. 2004; Grant R01 # HS11954.
90. Tschannen DJ. Organizational structure, process, and outcome: The effects of nurse staffing and nurse-physician collaboration on patient length of stay. Dissertation. 2005; DAI-B 66/02, p. 821, Aug 2005:AAT 3163954.
91. Houser E. Nurse staffing levels and patient outcomes. Dissertation. 2005; DAI-B 66/04, p. 1978, Oct 2005:AAT 3172609.
92. Halm M, Peterson M, Kandels M, et al. Hospital nurse staffing and patient mortality, emotional exhaustion, and job dissatisfaction. Clin Nurse Spec. Sep-Oct 2005; 19(5):241-51; quiz 52-4.
93. Donaldson N, Bolton LB, Aydin C, et al. Impact of California's licensed nurse-patient ratios on unit-level nurse staffing and patient outcomes. Policy Polit Nurs Pract. Aug 2005; 6(3):198-210.
94. Stratton KM. The relationship between pediatric nurse staffing and quality of care in the hospital setting. Dissertation. 2005; DAI-B 66/11, p. 5906, May 2006:AAT 3196584.
95. Seago JA, Williamson A, Atwood C. Longitudinal analyses of nurse staffing and patient outcomes: more about failure to rescue. J Nurs Adm. Jan 2006; 36(1):13-21.

Appendix F. Analytic Framework

Appendix F contains details on analytical framework of the meta-analysis: definitions, hypotheses, and statistical models.

Differences in definitions of nurse staffing. The variation in the ways nurse staffing rates are calculated and expressed makes it difficult to summarize data across studies. The nurse to patient or patients to nurse ratio reflects the number of patients cared for by one nurse typically specified by job category (RN, LPN, or LVN); this ratio may be calculated by shift or by nursing unit; some researchers use this term to mean nurse hours per inpatient day.

Various authors used different operational definitions for the nurse to patient ratio, including:

- number of patients cared for by one nurse per shift
- FTE/1,000 patient-days
- nurse/patient-day or FTE/occupied bed

Total nursing staff or hours per patient day represent all staff or all hours of care including RN, LPN, LVN, and aides counted per patient day (a patient day is the number of days any one patient stays in the hospital, i.e. one patient staying 10 days would be 10 patient days).

RN, LPN, or LVN full-time equivalents per patient day: (an FTE is 2,080 hours per year and can be composed of multiple part-time or one full-time individual.[1] FTE/occupied bed ratios were calculated based on FTE/mean annual number of occupied bed-days (patient-days).

We reported nursing rates as they were used by individual authors, but we have also created two standardized rates for purposes of comparison.

1. The number of patients cared by one nurse per shift. This ratio can be expressed as FTE/patient or patients/FTE per shift.
2. RN FTE/patient day ratio

We conducted separate analysis and report the results in these ways:

- with definitions the authors used
- corresponding to increase by 1 RN FTE/patient day
- in categories of patients/RN per shift in ICUs, and with surgical and medical patients.

Different methods have been used to estimate nurse hours per patient day from FTEs. Some investigators assume a 40 hour week and 52 working weeks per year (2,080 hours/year). Others use more conservative estimates (e.g. 37.5 hours per week for 48 weeks = 1,800 hours/year). In our conversions, we used the latter estimate:[2]

Nurse hours per patient day = (FTE*40)/patient days[3]

One nurse/patient day = 8 working hours per patient day [2]

Then the patient/nurse ratio = 24 hours/nurse hours per patient day.[3]

We made the following assumptions:

37.5 hour work week on average;

48 working weeks/year (4 weeks vacation, holidays, sick time);

All FTE are full-time nurses with the same shift distribution (assume 3 8-hour shifts);
Length of shift does not modify the association between nurse staffing and patient outcomes;
Patient density is the same over the year.

The same estimation was used for the each nurse job category- RN, LPN, and UAP.

The following examples of calculations may help clarify the approach to conversions.

1. The authors reported RN FTE/1,000 patient-days.
   We calculated:
   RN hours/patient days: [(RN FTE/1,000 *1,800hours)]/1,000
   Nurse to patient per shift ratio:
   Patient/nurse ratio = 24 hours/nurse hours per patient day[3]

Numeric example: The authors reported 3 RN FTE/1,000 patient days
RN hours/patient day = (3*1,800)/1,000=5.4 RN hours/patient day
Patients/RN per shift ratio = 24 hours/5.4 = 4.4 patients

2. The authors reported RN/patient day
We calculated
RN hours/patient days: (FTE*40)/5 patient days per week[3]
RN hours/patient day = FTE*8
Patients/RN per shift ratio = 24 hours/RN hours per patient day[3]

Numeric example: The authors reported 0.5 FTE/patient day
RN hours/patient day: 0.5 FTE*8 hours = 4 hours/patient day
Patients/RN per shift ratio = 24 hours/4 = 6 patients

3. The authors reported patients/RN per shift ratio.
   We calculated
   RN hours/patient day = 24 hours/reported ratio of patients/RN[3]
   RN FTE/patient day = RN hours per patient day/8 hours

Numeric example: The authors reported 2 patients/RN/shift
RN hours/patient day = 24 hours/2 = 12 hours/patient day
RN FTE/patient day = 12 hours per patient day/8 hours = 1.5 RN FTE

When the authors reported outcome rates among different categories of nurse staffing; we extracted the reported means or calculated medians of nurse staffing ranges. When the authors reported changes in outcomes corresponding to 1 unit increase in nurse staffing ratio. We defined a reference nurse staffing level equal to the published means[4,5] in different clinical settings assuming that the same linear association would be observed corresponding to an increase by 1 unit from the mean. This assumption ignores nonlinearity but provides more realistic staffing estimation. When the authors reported regression coefficients form several statistical models, we used maximum likelihood criteria to extract one regression coefficient for the pooled analysis—models with significant regression coefficient for the association:

- the smallest number of nonsignificant regression coefficients for confounding factors in the model
- main effects models without interaction and nonlinear associations.

Independent staffing variables for questions 1, 2, and 4 extracted from the studies:
RN FTE/patient day as a continuous variable
Patients/RN/shift ratio as a continuous variable
Quartiles of patients/RN/shift ratio as a categorical variable
Patients/LPN/shift ratio as a continuous variable
Patients/UAP/shift ratio as a continuous variable
Total nursing hours as a continuous variable equal nursing hours/patient or patient day
RN hours/patient day as a continuous variable equal RN hours/patient day
LPN hours/patient day as a continuous variable equal LPN hours/patient day
UAP hours/patient day as a continuous variable equal UAP hours/patient day
Licensed hours/patient day as a continuous variable equal RN and LPN hours/patient day

We calculated means, standard deviations, and quartiles of nurse staffing variables in different clinical settings to compare with published articles.[4,5]

Nurse Variables	Needleman et al
Number of hours of nursing care per patient-day	Mean ± STD
Registered nurse–hours	7.8 ± 1.9
Licensed-practical nurse–hours	1.2 ± 1.0
Aide hours	2.4 ± 1.2
Total	11.4 ± 2.3
Proportion of total hours of nursing care (%)	
Registered nurse hours	68 ± 10

The present report:

Nurse Staffing	Number of Studies	Mean	Standard Deviation
ICUs			
RN FTE/patient day	15	1.31	0.70
Patients/RN per shift	15	3.11	1.82
Total nursing hours/patient day	15	11.00	5.23
RN hours/patient day	10	12.61	5.28
LPN hours/patient day	3	0.34	0.57
UAP hours/patient day	4	2.26	1.20
Licensed nurse hours/patient day	1	7.29	0.43
Surgical patients			
RN FTE/patient day	13	1.14	0.84
Patients/RN per shift	13	4.04	2.32
Patients/LPN per shift	2	3.07	2.21
Total nursing hours/patient day	12	7.73	4.31
RN hours/patient day	11	7.81	5.28
LPN hours/patient day	7	1.49	1.58
UAP hours/patient day	5	2.07	0.62
Medical patients			
RN FTE/patient day	20	1.10	0.99
Patients/RN per shift	20	4.42	2.94
Patients/LPN per shift	6	13.25	8.52
Patients/UAP per shift	4	11.95	8.87
Patients/licensed nurse per shift	2	4.12	1.09
Total nursing hours/patient day	27	8.23	4.36
RN hours/patient day	23	6.06	3.60
LPN hours/patient day	13	2.84	3.33
UAP hours/patient day	12	2.97	3.22
Licensed nurse hours/patient day	4	3.32	2.92

Independent staffing strategies variables:

Skill mix % of RN nurses/total nursing personnel as a continuous variable
% of nurses with BSN degrees/total nursing personnel as a continuous variable
% of licensed nurses (RNs + LPNs)/total nursing personnel as a continuous variable

Experience mix: nurse experience in years as a continuous variable
% of overtime nursing hours as a continuous variable
% of temporary nurses as a continuous variable
% of full-time nurses as a continuous variable

The authors used different operational definitions of the outcomes rates: the percentage of the patients with outcomes among all hospitalized patients and the rates of the outcomes per 1,000 patient days. We reported these rates as they were used by the individual authors, but we have also standardized rates as the percentage of patients with outcomes among all hospitalized patients for purposes of comparison. We estimated that
Percentage of patients with outcomes = (rate per 1,000 patient days/10) * an average length of stay. We use published averages of length of stay in ICUs, in medical, and surgical patients.[4]

Weighting variable:
Sample size as patient or analytic unit number (when patient number was not reported); hospital number per every level of exposure.

Tested sources of heterogeneity:
1. Analytic unit
2. Patient population
3. Hospital unit
2. Study design
3. Adjustment for comorbidities
4. Definition of nurse to patient ratio
5. Quality scores
6. Adjustment for provider characteristics and patient socio-economic status
7. Adjustment for clustering between providers and patients
8. Source of the data (administrative vs. medical record)
9. Definition of outcomes

We tested the possible sources of heterogeneity as interaction variables which could modify the effect of nurse staffing on patient outcomes and conducted sensitivity analysis within each category of effect modifiers.

Hypotheses tested in pooled analysis:
1. The outcome is associated with nurse staffing as a continuous variable, weighted by the study sample size * number of hospitals, in a random effects model—random intercept for each study
2. The outcome is associated with nurse staffing as a continuous variable, weighted by the study sample size * number of hospitals, in a fixed effects model

3. The outcome is associated with nurse staffing as a continuous variable with nonlinear association, weighted by the study sample size * number of hospitals in a random effects model
4. The outcome is associated with nurse staffing as a continuous variable with nonlinear association, weighted by the study sample size * number of hospitals, in a fixed effects model
5. The association with nurse staffing as a continuous variable can be modified by analytic unit (hospital, unit, and patient levels), when the model is weighted by the study sample size * number of hospitals in a random effects model—random intercept for each study
6. The association with nurse staffing as a continuous variable can be modified by analytic unit when the model is weighted by the study sample size * number of hospitals in a fixed effects model
7. The association with nurse staffing as a continuous variable can be modified by hospital unit (ICU, medical, surgical) when the model is weighted by the study sample size * number of hospitals in a random effects model—random intercept for each study
8. The association with nurse staffing as a continuous variable can be modified by hospital unit when the model is weighted by the study sample size * number of hospitals in a fixed effects model
9. The association with nurse staffing as a continuous variable can be modified by patient type (medical vs. surgical) when the model is weighted by the study sample size * number of hospitals in a random effects model with a random intercept for each study.
10. The association with nurse staffing as continuous variables can be modified by patient type (medical vs. surgical) when the model is weighted by the study sample size * number of hospitals in a fixed effects model
11. The outcome was associated with nurse staffing as a categorical variables, weighted by the study sample size * number of hospitals, in a random effects model—random intercept for each study
12. The outcome is associated with nurse staffing as continuous variable weighted by the study sample size * number of hospitals in a fixed effects model
13. A sensitivity analysis by analytic units, hospital units, and patient population tested all previous hypotheses with random and fixed effects models weighted by the sample size in subgroups where the analytic units are hospitals, hospital units, and patients and the hospital units are ICU, medical, and surgical and the patients are medical and surgical
14. Individual studies were analyzed with simple linear regression in STATA to find slopes for each study when possible. Meta-analysis was used to estimate pooled regression coefficients: changes in outcomes corresponding to incremental changes by one unit in nurse staffing
15. Interaction models and sensitivity analysis examined the effects of the year of outcomes occurrence and adjustment for patient and provider characteristics and clustering of patients and providers.

<u>Algorithms of meta-analysis</u>[6]

Pooled estimate as a weighted average:

$$\theta_{IV} = \frac{\sum_i w_i \theta_i}{\sum_i w_i}$$

Weights are inverse of variance (standard error):[2]

$$w_i = \frac{1}{SE(\theta_i)^2}$$

Standard error of pooled estimate:

$$SE(\theta_{IV}) = \frac{1}{\sqrt{\sum_i w_i}}$$

Heterogeneity (between-study variability) measured by:

$$Q = \sum_i w_i(\theta_i - \theta_{IV})^2$$

Assumptions for random effects model: true effect sizes *qi* have a normal distribution with mean *q* and variance *t2*; *t2* is the between-study variance
Between study variance:

$$\tau^2 = \frac{Q - (k-1)}{\sum_i w_i - \left(\frac{\sum_i w_i^2}{\sum_i w_i} \right)}$$

Where:
wi are the weights from the fixed effect inverse-variance method
Q is the heterogeneity test statistic from before (either from inverse-variance method or Mantel-Haenszel method)
k is the number of studies, and
t2 is set to zero if $Q<k-1$
Random effect pooled estimate is weighted average:

$$\theta_{DL} = \frac{\sum_i w'_i \theta_i}{\sum_i w'_i}$$

Weights used for the pooled estimate are similar to the inverse-variance, but now incorporate a component for between-study variation:

$$w'_i = \frac{1}{SE(\theta_i)^2 + \tau^2}$$

Standard error of pooled estimate

$$SE(\theta_{DL}) = \frac{1}{\sqrt{\sum_i w'_i}}$$

The likelihood-based approach to general linear mixed models was used to analyze the association between independent variable and outcomes with the basic assumption that the data are linearly related to unobserved multivariate normal random variables.

General linear model $Y = X\beta + \varepsilon$
(Y - the vector of observed y_i's, $\boldsymbol{X}$ - known matrix of x_{ij}'s, β- the unknown *fixed-effects* parameter vector, and ε - the unobserved vector of independent and identically distributed Gaussian random errors) is written in the mixed model:
$Y = X\beta + Z\lambda + \varepsilon$
where Z - known design matrix, and λ the vector of unknown *random-effects parameters.*
The model assumes that λ and ε are normally distributed.

Attributable risk was calculated as the outcome events rate in patients exposed to different nurse staffing levels.[7-9]

Attributable risk of the outcome = rate of events in patients with below of the recommended nurse/patient ratio x (relative risk = 1)

Number needed to treat to prevent one adverse event was calculated as reciprocal to absolute risk differences in rates of outcomes events in the groups of the patients with different nurse staffing levels.[10]

Administrative data was obtained to estimate nurse shortage and distribution in a state level in the USA.[11,12] Correlation between nurse distribution and fatal adverse events related to health care were computed with 95%confidence level to determine a strength and directions of the correlations.[13]

Definitions of fatal injuries related to health care:
Misadventures to patients during surgical and medical care (E870-E876):
E870 Accidental cut, puncture, perforation, or hemorrhage during medical care-
E870.0 Surgical operation
E870.1 Infusion or transfusion
E870.2 Kidney dialysis or other perfusion
E870.3 Injection or vaccination
E870.4 Endoscopic examination
E870.5 Aspiration of fluid or tissue, puncture, and catheterization
Abdominal paracentesis
Aspirating needle biopsy
Blood sampling
Lumbar puncture
Thoracentesis
E871 Foreign object left in body during procedure
E872 Failure of sterile precautions during procedure
E873 Failure in dosage
E873.0 Excessive amount of blood or other fluid during transfusion or infusion
E873.1 Incorrect dilution of fluid during infusion
E873.2 Overdose of radiation in therapy
E873.3 Inadvertent exposure of patient to radiation during medical care
E873.4 Failure in dosage in electroshock or insulin-shock therapy
E873.5 Inappropriate [too hot or too cold] temperature in local application and packing

E873.6 Nonadministration of necessary drug or medicinal substance
E873.8 Other specified failure in dosage
E873.9 Unspecified failure in dosage
E874 Mechanical failure of instrument or apparatus during procedure
E875 Contaminated or infected blood, other fluid, drug, or biological substance
Includes:
presence of:
bacterial pyrogens
endotoxin-producing bacteria
serum hepatitis-producing agent
E876 Other and unspecified misadventures during medical care
E876.0 Mismatched blood in transfusion
E876.1 Wrong fluid in infusion
E876.2 Failure in suture and ligature during surgical operation
E876.3 Endotracheal tube wrongly placed during anesthetic procedure
E876.4 Failure to introduce or to remove other tube or instrument
E876.5 Performance of inappropriate operation
E876.8 Other specified misadventures during medical care
Performance of inappropriate treatment NEC
E876.9 Unspecified misadventure during medical care

Surgical and medical procedures as the cause of abnormal reaction of patient or later complication, without mention of misadventure at the time of procedure (E878-E879)
Includes:
procedures as the cause of abnormal reaction, such as:
displacement or malfunction of prosthetic device
hepatorenal failure, postoperative
malfunction of external stoma
postoperative intestinal obstruction
rejection of transplanted organ
E878 Surgical operation and other surgical procedures as the cause of abnormal reaction of patient, or of later complication, without mention of misadventure at the time of operation
E879 Other procedures, without mention of misadventure at the time of procedure, as the cause of abnormal reaction of patient, or of later complication

Drugs, medicinal and biological substances causing adverse effects in therapeutic use (E930-E949)
Includes:
correct drug properly administered in therapeutic or prophylactic dosage, as the cause of any adverse effect including allergic or hypersensitivity reactions

References

1. United States: Agency for Healthcare Research and Quality; University of California SF-SE-BPC. Making health care safer: a critical analysis of patient safety practices. Chapter 39. Nurse Staffing, Models of Care Delivery, and Interventions. Rockville, MD: Agency for Healthcare Research and Quality; 2001.
2. American Nurses Association. Nurse Staffing and Patient Outcomes: In the Inpatient Hospital Setting. Washington DC: American Nurses Association; 2000.
3. Spetz J. Minimum nurse staffing ratios in California acute care hospitals. San Francisco: California Workforce Initiative; 2000.
4. Needleman J. Nurse staffing and patient outcomes in hospitals. Final Report for Health Resources Services Administration. 2001; Contract No. 230990021.
5. Kovner C, Jones CB, Gergen PJ, Nurse Staffing in Acute Care Hospitals, 1990-1996. Policy, Politics, & Nursing Practice. 2000;1(3):194-204.
6. DerSimonian R, Laird N. Meta-analysis in clinical trials. Control Clin Trials. Sep 1986;7(3):177-88.
7. Dawson B and Trapp RG. Basic & Clinical Biostatistics (LANGE Basic Science). McGraw-Hill/Appleton & Lange. 2004.
8. Harold A. Kahn CTS. Statistical Methods in Epidemiology (Monographs in Epidemiology and Biostatistics). Oxford University Press, USA. 1989.
9. Egger M. Systematic Reviews in Health Care. BMJ, London, 2001 ISBN:0-7279-1488-X. http://www.blackwellpublishing.com/medicine/bmj/systreviews/pdfs/chapter18.pdf.
10. Ebrahim S. The use of numbers needed to treat derived from systematic reviews and meta-analysis. Caveats and pitfalls. Eval Health Prof. Jun 2001;24(2):152-64.
11. Cho S-H. Nurse staffing and adverse patient outcomes [PhD]: Dissertation, University of Michigan; 2002.
12. Spratley E. The registered nurse population. March 2000, findings from the National Sample Survey of Registered Nurses. Rockville, MD; U.S. Dept. of Health & Human Services, Health Resources and Services Administration, Bureau of Health Professions, Division of Nursing. 2000: http://www.bhpr.hrsa.gov/healthworkforce/reports/rnsurvey/rnss1.htm.
13. Centers for Disease Control. WISQARS Injury Mortality Reports. 1999-2003; Dept. of Health and Human Services, Public Health Services; OCLC: 44350522: http://www.cdc.gov/ncipc/.

Appendix G: Evidence Tables

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes

Case control studies

Author, Year, Publication Type	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis, Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Fridkin, 1966[1] Article	Examine the associations between nurse staffing and central venous catheter-associated bloodstream infections	Single hospital study: university-affiliated Veterans Affairs medical center	1992-1993, Patient, Random sample of 1,760 patients	Medical records, Adults, Catheter-associated bloodstream infections, Veterans Affairs	Patient age, gender, length of stay, primary diagnosis, severity of illness	Bloodstream infections
Arnow, 1982[2] Article	Examine association between staffing by overtime or temporary nurses and nosocomial infection in a burn unit	Single unit study, Medical records	1975, Patient, 147 patients, 27.21%	Medical records, Adults	Not reported	Nosocomial infection
Marcin, 2005[3] Article	Examine the association between unplanned extubation and years of nurse experience and nurse-to-patient ratio in the pediatric intensive care unit	Single hospital study	1999-2002, Patient, 220 patients	Medical records, Children	Matching: a) weaning status and duration of intubation; b) patient age; and c) severity of illness as defined by PRISM III. Adjustment: patient age, physical restraints, sedation, patient agitation	Unplanned extubation

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis, Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Aiken, 1998[4] Article	Examine association between hospital organization , nurse burnout, an patient satisfaction	American Hospital Association Annual Hospital Survey	1990-1991, Patient, 1,393 patients, 13.50%	Medical records, Adults, AIDS	Patient sex, age, race, type of insurance, HIV risk categories, illness severity; admitting physician as a part of an AIDS specialty service; the extent of nurse control over practice environment	Patient satisfaction
Aiken, 1999[5] Article	Compare differences in AIDS patients' 30-day mortality and satisfaction with care in dedicated AIDS units, scattered-bed units in hospitals with and without dedicated AIDS units, and in magnet hospitals known to provide good nursing care	American Hospital Association Annual Hospital Survey	1990-1991, Patient, 1,393 patients, 13.50%	Medical records, Adults, AIDS	Patient sex, age, race, type of insurance, HIV risk categories, illness severity; admitting physician as a part of an AIDS specialty service; the extent of nurse control over practice environment	Mortality. patient satisfaction
Robert, 2000[6] Article	Examine the association between nosocomial primary bloodstream infections (BSIs) and nursing-staff levels in surgical intensive care unit (SICU) patients	Single hospital study - 20-bed SICU in a 1,000-bed inner-city public hospital, 100, South	1994-1995, Patient, Random sample of 127 patients	Medical records, Adults, Nosocomial primary bloodstream infections	Patient age, diagnosis, comorbidity, length of stay	Bloodstream infection

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis, Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Aiken, 1994[7] Article	Examine the association between Medicare mortality and hospitals with different nursing care	39 magnet hospitals and 195 control hospitals, selected using a multivariate matched sampling procedure that controls for hospital characteristics, 28.2%, 7.7%	1988, Hospital, Random sample of 234 hospitals	Administrative, Adults, 65, Medicare	Patient age, sex, comorbidities, type and source of admission, propensity scores for 12 hospital characteristics census, size occupancy rate, location, technology index)	Mortality

Case-series

Author, Year, Publication Type	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Seago, 1999[8] Article	Examine the association of patient-focused care at one tertiary care university teaching hospital on patient outcomes	Single tertiary care hospital study before and after implementation of patient-focused care	1996-1997, Patient, 89,256 patients	Medical records, Adults	Not reported	Patient satisfaction, pressure ulcers, falls
Donaldson, 2005[9] Article	Examine patients' outcomes before and after legislations for mandatory nurse/patient ratios in California hospitals	Convenience sample of 68 acute hospitals participating in the California Nursing Outcomes Coalition project	2004-2005, Unit, 268, 39.55%	Administrative, Adults	Not reported; before-after comparison were conducted in the same units	Pressure ulcers. falls

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Grillo-Peck, 1995[10] Article	Examine the impact of implementation of a new nursing partnership model with a reduction of RN from 80% to 60% on patient outcomes in neuroscience unit	Single hospital study	1995-1993, Patient, 156 patients	Medical records, Adults, Cerebro vascular diseases	Not reported. The authors reported that patients had similar demographic characteristics	Length of stay, nosocomial infection, falls

Cross-sectional studies

Author, Year, Publication Type	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis, Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Hartz, 1989[11] Article	Examine the association between nurse staffing and mortality in Medicare population	3,100 hospitals from the 1986 HCFA mortality study and the American Hospital Association's 1986 annual survey of hospitals, 8.1%, 11.9%	1986, Hospital, 5,781 patients 46.38%	Administrative, Adults >65years, Medicare	Severity of illness	Mortality

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis, Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Krakauer, 1992[12] Article	Examine the association of nurse staffing on mortality in Medicare population	84 statistically selected hospitals from 1986 American Hospital Association (AHA) survey, Single hospital study	1986, Hospital, 42,773 patients, Random sampling, bias assessed	Medical records Adults, >65 years, Medicare	Patient one principal discharge diagnosis, up to four secondary diagnoses, age, sex, race, comorbidities, transfer status; hospital size, location, finances, technical capability of the hospital, cluster patients and hospitals	Mortality
McDaniel, 1992[13] Article	Examine relationship between nurse turnover and patient and nurse satisfaction	Single hospital study	Patient, 300 patients	Medical records, Adults	Not reported	Patient satisfaction
Halpine, 1993[14] Article	Examine the association between nurse staffing and length of stay in Ontario hospitals	The Hospital Medical Records Institute, 75%	1989-1990, Hospital, 40,000 patients, 22.36%	Administrative	Nursing intensity index	Length of stay
Shamian, 1994[15] Article	Examine relationship between length of stay and hours per patient day in 11 clinical specialty areas	58 hospitals in the U.S., 33%	Unit, 1,733 patients	Administrative	Patient age, primary and secondary diagnosis; hospital unionization, unit computerization, hospital ownership	Length of stay
Taunton, 1994[16] Article	Examine associations between patient outcomes and staff registered nurse absenteeism	Taunton, 25%	1989-1990, Unit, 65 units	Administrative, Adults	Not reported	Urinary tract infection, falls, bloodstream infection

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis, Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Dugan, 1996[17] Article	Examine the association between nurses' perceived stress and patient incidents, including falls	Single hospital study	1996, Nurse, 600 nurses, 51.17%	Survey	Not reported	Falls
Bloom, 1997[18] Article	Examine association between registered nurses (RNs) from temporary agencies; part-time career RNs; RN rich skill mix; and organizationally experienced RNs on operational and total hospital cost	1981 AHA annual survey of hospitals; A 20% random sample (1,222 hospitals)	Hospital, 732 hospitals, 20.36%, Random sampling, sample bias assessed	Administrative, Adults	Hospital size, ownership/control, teaching status, operating capacity, geographic region, urban/rural status, local economic climate, hospital wage rates, supply of nursing labor within the community	Length of stay
Minnick, 1997[19] Article	Examine association between nurse staffing and patient satisfaction	117 no intensive medical-surgical inpatient units in 17 hospitals selected from a pool of 69 institutions within a metropolitan area by a stratified random sample	1991-1992, Unit, 2,595 patients, 20.96%	Survey, Adults	Patient age, gender, marital status, race, education, diagnosis	Patient satisfaction
Melberg, 1997[20] Book	Examine the association between nurse staffing and length of stay	Single system in California, 100%, Pacific	1994-1995, Hospital, 5%	Administrative, Adults	Not reported	Length of stay

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis, Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Leiter, 1998[21] Article	Examine the relationships of nurse burnout, intention to quit, and meaningfulness of work as assessed on a staff survey with patient satisfaction with nursing care	Single hospital study	1998, Patient Random sample of 605 patients	Survey	Not reported	Patient satisfaction
Kovner, 1998[22] Article	Examine the relationship between nurse staffing and adverse events controlling for related hospital characteristics	Stratified probability sample of U.S. community hospitals - 589 acute-care hospitals in 10 states, 21%, 11.8%	1993, Hospital, 900 hospitals, 34.56%	Administrative, Adults, >18years	Case mix (patient age, sex, and comorbidity); hospital teaching status, ownership, bed size, region	Urinary tract infection, gastrointestinal bleeding, pneumonia, pulmonary failure. thrombosis, acute myocardial infarction as a secondary diagnosis after surgery
Hoover, 2000[23] Dissertation	Examine the association between managed care penetration, nurse staffing, and hospital outcomes in three southern states	American Hospital Association Annual Survey, Health Care Financing Administration, Mississippi State Department of Public Health Office of Rural Health, U.S. Census Bureau	1995-1997, Hospital, 271 hospitals, 35.06%	Administrative, Adults, >65 years, Chronic obstructive pulmonary disease, viral pneumonia, heart attack, shock, stroke, and hip procedures, Medicare	Patient age, sex, race, procedure, comorbidity; hospital size, location, and teaching status	Mortality, length of stay

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis, Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Gandjour, 2000[24] Article	Determine the effect of managed health care plans on hospital staffing	Tennessee Department of Health, 17%, 25.97%, 29-60%	1995, Hospital, 151 hospitals, 49.01%	Administrative, Adults	Medicare case-mix, number of patient days, hospital beds, average salary, hospital status, occupancy rate	Length of stay
Ridge, 2001[25] Dissertation	Examine the association between nurse staffing and patient satisfaction	Single hospital study-JCAHO-accredited tertiary care hospital, 100%	1997-1999, Patient, 5,509 patients, 80.47%	Survey, Adults	Patient age, gender, race, and acuity, Medicare case mix, primary and secondary diagnoses	Length of stay, patient satisfaction
Bolton, 2001[26] Article	Examine association between nurse staffing and patient safety outcomes	Voluntary sample of California acute care hospitals; 257 medical, surgical, medical-surgical combined, step-down, 24-hour observation units, and critical care patient care units, 9% of all general acute care hospitals in California	1998-1999, Unit, 257 units, Sampling bias, Assessed	Administrative, Adults, >16 years	Not reported	Pressure ulcers, falls
Aiken, 2001[27] Article	Examine the association between nurse staffing and mortality	Hospital Association Annual Survey	1997-1998, Hospital, 22 hospitals	Administrative, Adults, Medicare	Not reported	Mortality

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis, Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Needleman, 2001[28,29] Report	Examine the relationship between patient outcomes potentially sensitive to nursing and nurse staffing in inpatient units in acute care hospitals	American Hospital Association Annual Survey of hospitals; hospital patient discharge data and state hospital financial reports or hospital staffing surveys; 11 states across the U.S.	1997, Hospital, 3,173,705 patients	Administrative	Patient diagnosis, age, sex, comorbidities, health care, emergency admission, hospital location, number of beds, occupancy rate, teaching status, patient acuity in each hospital's mix of patients	Gastrointestinal bleeding, pneumonia, shock, failure to rescue, pressure ulcers, pulmonary failure. surgical wound infection, thrombosis, cardiac arrest and CPR, CNS complications (coma and stupor, acute delirium, reactive confusion, reactive depression), physiologic/ metabolic complications bloodstream infection

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis, Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Cho, 2002[30] Dissertation	Examine the association between nurse staffing and adverse patient outcomes	Hospital Financial Data and HCUP State Inpatient Database, 5.6%, 29.7%	1997, Hospital, 124,204 patients	Administrative, Adults, >18 years	Patient age, sex, race, primary payer, DRG, number of diagnoses at admission, and type of admission (scheduled or unscheduled); hospital location, size, teaching status, ownership; clustering patients in hospitals (two levels model)	Urinary tract infection, pressure ulcers, falls, surgical wound infection, bloodstream infection
Oster, 2002[31] Dissertation	Examine the association between nurse staffing and patient outcomes in patient with acute myocardial infarction in urban emergency department	Single hospital study in an academic medical center	2000-2001, Patient, 543 patients	Medical records, Adults, Acute myocardial infarction	Patient age, sex, ethnicity, payer type	Length of stay
Cheung, 2002[32] Dissertation	Examine the association between nurse staffing, time spent on direct and indirect care, and adverse events in five inpatient units in acute care hospital	Single hospital study	Nurse, 1,007 nurses	Medical records, Adults, >17 years	Unit acuity, skill mix, total number of nursing personnel, events, and nursing characteristics	Pressure ulcers, falls, nosocomial infection, unexpected injury not due to underlying condition of the patients that occurs during the care: falls, decubitus ulcers, medication errors, and blood stream infections

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis, Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Langemo, 2002[33] Article	Examine nursing quality outcome indicators (falls and pressure ulcers) after implementation of ANA Nursing Care Report Card	North Dakota Nurses Association (NDNA) Research Council	2003, Patient, 942 patients	Administrative, Adults	Not reported	Patient satisfaction, pressure ulcers, falls
Seago, 2002[34] Article	Examine the relationship between the presence of a bargaining unit for registered nurses and the acute myocardial infarction mortality rate for acute care hospitals in California	California Office of Statewide Health Planning and Development (OSHPD) Hospital Disclosure Report database	1991-1993, Hospital, 385 hospitals, 10.91%, Sampling bias assessed	Medical records, Adults, Acute myocardial infarction	Patient age, sex, severity of illness; hospital services, patient volume, teaching status, number of MDs per acute myocardial infarction-related discharges, the cardiac technology index, rural status and the Hospital Service Area (HSA) wage index	Mortality
Needleman, 2002[29] Article based on the report	Examine the relationship between the amount of care provided by nurses at the hospital and patients' outcomes	American Hospital Association's Annual Survey of Hospitals	1997, Hospital, 6,180,628 patients	Administrative, Adults	Rate of the outcome in the patient's diagnosis-related group, state of residence, age, sex, primary health insurer, emergency admission, and comorbidities, hospital number of beds, teaching status, state, and metropolitan or non metropolitan location	Mortality, urinary tract infection, gastrointestinal bleeding, pneumonia, shock, failure to rescue

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis, Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Kovner, 2002[35] Article	Examine the association between nurse staffing and patient adverse events after controlling for hospital characteristics	National Inpatient Sample, 80.5%	1990-1996, Hospital, Random sample of 570 hospitals	Administrative, Adults, >18 years	Medicare Case Mix Index, hospital bed size, location, region, ownership, teaching status, HMO penetration	Urinary tract infection, pneumonia, pulmonary failure, thrombosis
Whitman, 2002[36] Article	Determine the relationships between nursing staffing and specific nurse-sensitive outcomes (central line blood-associated infection, pressure ulcer, fall, medication error, and restraint application duration rates) across specialty units	Secondary analysis of prospective, observational data from 10 adult acute care hospitals	1999, Unit, 95 units	Administrative, Adults	Not reported	Pressure ulcers, falls, bloodstream infection
Beckman, 2003[37] Dissertation	Examine association between nurse management and patient outcomes	Single hospital study, 100%, 17%	1999-2000, Patient, 429 patients, 74.36%	Survey, Adults	Patient age, sex, race	Random, length of stay

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis, Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Cho, 2003[38] Article	Examine the effects of nurse staffing on adverse events, morbidity, mortality, and medical costs	Hospital financial data, state Inpatient databases, 5%, 20%	1996-1999, Patient, 124,204 patients	Administrative, Adults, >18 years	Patient age, sex, race, primary payer, DRG, number of diagnoses at admission, and type of admission (scheduled or unscheduled); hospital location, size, teaching status, ownership; clustering patients in hospitals (two levels model)	Urinary tract infection, pressure ulcers, falls, surgical wound infection, bloodstream infection, ICD-9-CM for adverse drug event
Aiken, 2003[39] Article	Examine whether the proportion of hospital RNs educated at the baccalaureate level or higher is associated with risk-adjusted mortality and failure to rescue (deaths in surgical patients with serious complications	Pennsylvania Health Care Cost Containment Council, 36%	1998-1999, Patient, 232,342 patients	Administrative, Adults, >20 years, general surgical, orthopedic, vascular operation	Patient age, sex, referral from another hospital, comorbidities; hospital size, teaching status, and technology; having a board-certified surgeon	Mortality, failure to rescue
Potter, 2003[40] Article	Examine the association between nurse staffing and patient outcomes at the unit level in the acute care adjusting for patient acuity and proportion of floating nurses	Single hospital study, 100%	1999-2001, Unit, 32 units	Medical records, Adults	Not reported	Patient satisfaction, falls

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis, Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Langemo, 2003[41] Article	Examine the association between pressure ulcer incidence, staff mix, and nursing care hours	Midwest Research Institute/National Database of Nursing Quality Indicators	2003, Hospital, 942 hospitals	Administrative	Not reported	Pressure ulcers
Bolton, 2003[42] Article	Examine the relationship between nurse staffing and patient perceptions of nursing care in a convenience sample of 40 California hospitals	Hospitals participating in both the ongoing California Nursing Outcomes Coalition statewide database project and the statewide Patients' Evaluation of Performance in California project	1998-2000, Hospital, 113 hospitals	Administrative, Adults	Not reported	Patient satisfaction
Needleman, 2003[43] Article	Assess whether adverse outcomes in Medicare patients can be used as a surrogate for measures from all patients in quality of care research using administrative datasets	National MedPAR discharge data for Medicare patients from 3,357 hospitals, state hospital staffing surveys or financial reports, American Hospital Association Annual Survey, present sample is 26% of all discharges in the U.S. in 1997	1997-1998, Hospital, 6,180,628 patients	Administrative, Adults	Patient age, sex, primary DRG, health insurance, emergency admission, and comorbidities, hospital teaching, metropolitan status, and bed size	Length of stay, urinary tract infection, gastrointestinal bleeding, pneumonia, shock, failure to rescue, pressure ulcers, surgical wound infection, cardiac arrest and CPR, bloodstream infection

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis, Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Vahey, 2004[44] Article	Examine the effects of the nurse work environment and nurse burnout on patients' satisfaction with their nursing care	40 units in 20 urban hospitals across the U.S. (sample from the study of quality of care in AIDS patients)	1991, Patient, 722 patients, 13.99%	Survey, Adults, AIDS	Patient age, sex, and race, severity of illness, nurse sex, race, age, experience in nursing and in the unit; clustering nurses and patients within hospitals	Patient satisfaction
Sochalski, 2004[45] Article	Examine the effects of nurse staffing and process of nursing care indicators on assessments of the quality of nursing care	Hospitals where responding licensed RNs in Pennsylvania worked in 1999	1999, Nurse, 8,500 nurses, 7.70%, Random sample, Bias assessed	Survey	Nurses clustered within hospitals, nurses perceived quality of care and patient safety	Falls
Van Doren, 2004[46] Article	Examine the relationships between congestive heart failure patient outcomes and RN hours	Single hospital study, 75%	1998, 0.57%, Random of 175 patients	Medical records, Adults, Heart failure	Not reported	Length of stay
Boyle, 2004[47] Article	Examine the association between nurse autonomy and collaboration and patient outcomes	Single hospital study, 100%	2001, Unit, 11,496 patients	Survey, Adults	Case mix index	Mortality, length of stay, urinary tract infection, pneumonia, failure to rescue, pressure ulcers, falls, cardiac arrest, and CPR

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis, Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Donaldson, 2005[9] Report	Test associations between daily nurse staffing in adult medical-surgical units and hospital acquired pressure ulcers, patient falls	25 acute care, not-for-profit California hospitals, the part of the California Nursing Outcomes Coalition (CalNOC)	2002-2003, Unit, 77 units	Administrative, Adults	Hospital rural/urban designation; ownership; no. licensed acute care beds; average daily census	Pressure ulcers, falls, adverse events, unexpected clinical events not related to the patient's illness or underlying condition resulting in unanticipated death or major permanent loss of function, or adversely affects the patient care quality or outcomes
Tschannen, 2005[48] Dissertation	Examine association between patient length of stay and nurse staffing and nurse-physician collaboration	Single hospital study	2005, Patient, 406 patients, 23.65%	Medical records	Patient DRG, age, gender, acuity scores, unit of admission, admission type and source, and comorbidities; nursing characteristics	Length of stay
Houser, 2005[49] Dissertation	Examine the association between nurse staffing and nurse-sensitive patient outcomes	American Hospital Association Annual Survey (685 hospitals); 20% random sample of U.S. hospitals	2001, Patient, 7,452,727 patients, 24.37%, Random sample	Administrative, Adults	Patient age, race, sex, health insurance, comorbidity; hospital size, teaching status, location, ownership	Length of stay, failure to rescue, pressure ulcers, pulmonary failure, thrombosis

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis, Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Estabrooks, 2005[50] Article	Examine the association between nurse education and skill mix, and 30-day mortality after adjusting for institutional factors and individual patients characteristic	International Hospital Outcome Study, 8.2%	1998-1999, Patient, 18,142 patients	Administrative, Adults, >18 years, acute myocardial infarction, stroke, congestive heart failure, chronic obstructive pulmonary disease, pneumonia	Comorbidity scores, patient age, and gender	Mortality
Halm, 2005[51] Article	Examine the association between nurse-to-patient ratio and patient mortality, failure to rescue, emotional exhaustion and job satisfaction of nurse	Single hospital study, 100%, 0%	2002, Patient, 6,216 patients, 56.42%	Administrative, Adults, General, orthopedic, and vascular surgery	Patients demographics, emergency department admission, comorbidity and complications	Mortality, failure to rescue

Studies that assessed temporality in association between patient outcomes and nurse staffing patterns

Author, Year, Publication Type, Data Collection	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Wan, 1987[52] Article, Retrospective	Examine association between nurse staffing and patient adverse events in 45 community acute care hospitals across the U.S.	Health area resources file, hospital survey	1985, Hospital, 60 hospitals, 25.0%	Administrative, Adults	Severity of adverse event	Falls

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type, Data Collection	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Flood, 1988[53] Article, Prospective	Examine association between nurse shortage and length of stay	Single hospital study	1986, Patient, 497 patients	Medical records, Adults	Not reported, subgroup analysis by patient acuity	Length of stay, adverse events, infections including urinary tract infection and gangrene; congestive heart failure, and arrhythmias, gastrointestinal bleeding
Shortell, 1994[15] Article, Retrospective	Examine staffing factors associated with risk-adjusted mortality, risk-adjusted average length of stay, and nurse turnover	1,691 non federal U.S. hospitals with >200 beds, 53%, 12%	1988-1990, Unit, 17,440 patients, Random sample, bias assessed	Administrative, Adults, >16 years	Patient demographic characteristics, primary DRG and comorbidity (APACHE III scores)	Mortality
Shortell, 1988[54] Article, Retrospective	Examine the association between the proportion of RNs on mortality rates in Medicare patients for 16 selected clinical conditions	981 hospitals in 45 states, 46%	1983-1984, Hospital, 214,839 patients, Sample bias Assessed	Administrative, Adults, >65 years, >16 years, Selected clinical conditions, Medicare	Patient age, sex, comorbidity, length of stay, Medicare case mix; hospital's size, location, ownership	Mortality, length of stay
Thorson, 1995[55] Dissertation, Retrospective	Relationship between the available hours of RN care and patient outcomes, defined as discharge disposition and death	Acute care short term hospitals in North Carolina, 19%	1988-1993, Patient, 146,000 patients	Medical records, Adults	Patient age, gender, length of stay, major diagnostic category; hospital ownership, occupancy, size, location, teaching status, and technology	Mortality, length of stay

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type, Data Collection	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
ANA, 1997[56] Report, Retrospective	Examine association between nurse staffing and patient outcomes	502 hospitals from California, Massachusetts, and New York	1992-1994, Hospital, 502 hospitals, Sample bias assessed	Administrative	Nursing Intensity weights, hospital teaching status, location	Length of stay, urinary tract infection, pneumonia, pressure ulcers, nosocomial infection
Archibald, 1997[57] Article, Retrospective	Examine the effect of fluctuations in cardiac intensive care unit nurse staffing levels and patient census on cardiac care unit nosocomial infection rate	Single hospital study	1994-1995, Patient, 782 patients	Medical records, Children	Not reported	Nosocomial infection
Blegen, 1998[58] Article, Retrospective	Describe, at the level of the nursing care unit, the relationships among total hours of nursing care, registered nurse skill mix, and adverse patient outcomes	Consortium of hospitals members of Information and Quality Healthcare	1993, Unit, 42 units	Administrative, Adults	Patient severity, nursing acuity system	Mortality, patient satisfaction, pressure ulcers, falls, nosocomial infection
Blegen, 1998[59] Article, Retrospective	Determine the relationship between different levels of nurse staffing (total hours/patient day and proportion of RNs) and patient falls and cardiovascular arrests	Consortium of hospitals members of Information and Quality Healthcare	1993-1995, Unit, 39	Administrative, Adults	Medicare case mix scores	Falls, cardiac arrest, and CPR
Bond, 1999[60] Article, Retrospective	Examine associations between nurse staffing levels and mortality rates in 3,763 U.S. hospitals	American Hospital Association's Abridged Guide to the Health Care Field, 8.3%, 14.2%	1992, Hospital, 4,822 hospitals, 21.96%	Administrative, Adults, Medicare	Severity of illness: % of ICU days, annual number of emergency room visits/average daily census, and % of Medicaid patients	Mortality

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type, Data Collection	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Pronovost, 1999[61] Article, Retrospective	Determine whether nurse to patient ratio in ICUs is associated with length of stay in abdominal aortic surgery patients who typically receive care in an ICU	Maryland Health Services Cost Review Commission	1994-1996, Patient, 2,996 patients, 0.30%, Sample bias assessed	Medical records, Adults, >30 years, Abdominal aortic surgery	Patients' age, sex, race, nature of admission, type of aneurism, comorbidity, surgeon and hospital volumes	Mortality, length of stay
Robertson, 1999[62] Article, Retrospective	Examine the association between staffing intensity, skill mix, and mortality in patients with chronic obstructive lung disease	American Hospital Association	1989-1991, Hospital, 5,708 patients, Sample bias assessed	Administrative, Adults, chronic obstructive pulmonary disease, Medicare	Severity of illness and comorbidity (Medicare case mix index); hospital's financial status, ownership, technology index, size, staffing variables (nursing, physicians, technologists)	Mortality
Lichtig, 1999[63] Article, Retrospective	Examine the relationships between patient outcome indicators and nurse staffing	Hospital cost reports from New York and California	1992,1994, Hospital, 691, 33.00%	Administrative, Adults	Nursing intensity weights based on patients' characteristics, teaching status, and location	Length of stay, urinary tract infection, pneumonia, pressure ulcers, surgical wound infection

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type, Data Collection	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Amaravadi, 2000[64] Article, Retrospective	Determine if a night-time nurse-to-patient ratio in the intensive care unit is associated with clinical and economic outcomes following esophageal resection	Maryland Health Service Cost Review Commission	1994-1996, Patient, 366 patients in 32 hospitals	Adults, >18 years, Esophageal resection	Patient age, sex, nature of admission, type of operation, comorbid disease and hospital and surgeon volume; clustering of outcomes within a hospital	Mortality, length of stay, pneumonia, pulmonary failure, unplanned extubation, cardiac arrest and CPR, septicemia postoperative infection, myocardial infarction, surgical complications, acute renal failure

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type, Data Collection	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
ANA, 2000[65] Report, Retrospective	Examine the association between nurse staffing and patient outcomes in the inpatient hospital settings	HCFA	1992-1996, Hospital, 14,251,921 patients, 9.32%	Administrative, Adults, >75 years, Medicare	Large urban location (Y/N); rural location (Y/N); teaching status; nursing intensity weights	Length of stay, urinary tract infection, pneumonia, pressure ulcers, surgical wound infection, thrombosis, anoxic brain damage; communicable conditions; complications in post-partum period; diabetic complications, joint effusion, metabolic imbalances, personal care complications, psychiatric secondary diagnosis, transfusion reactions, trauma in non-trauma patients, adverse drug reactions

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type, Data Collection	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Unruh, 2000[66] Dissertation, Retrospective	Examine the association between nurse staffing and quality of patient care	211 hospitals yearly, 1,477 during 7 years acute care hospitals in Pennsylvania, State Department of health with unique information on nurse staffing and patients discharge, 0.4%	1991-1997, Patient, 83,924 patients	Administrative	Patient age, gender, race, acuity (Mediqual, hospital location, size, ratio of board certified physicians/ adjusted patients days of care; hospital restructuring including capacity utilization, merger status, ownership, number of administrators/ adjusted patients days of care	Mortality, length of stay, urinary tract infection, pneumonia, pressure ulcers, falls, pulmonary failure, surgical wound infection, cardiac arrest and CPR, complications: secondary diagnosis of misadventures to patients during surgical and medical care

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type, Data Collection	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Silber, 2000[67] Article, Retrospective	Examine the association between nurse staffing and patient outcomes in surgical Medicare patients	Medicare patients in 245 hospitals	1991-1994, Hospital, 217,440 patients	Administrative, Adults, >65 years, Medicare	27 patient characteristics including age, sex, race, diagnosis and comorbidities, hospital size, location, technology, % of certified physicians and anesthesiologists	Mortality, failure to rescue, in-hospital complication rate, cardiac event, congestive heart failure, shock, deep vein thrombosis and pulmonary embolus, stroke, transient ischemic attack, coma, nosocomial infections, pneumonia, pulmonary failure, pressure ulcers, wound infections, sepsis, bleeding
Whitman, 2001[68] Article, Prospective	Examine the relationship between restraint use and staffing	A secondary analysis of prospective, observational data from 10 adult acute care hospitals with bed capacity ranging from 59–861 beds, in an integrated healthcare system in the east, 50%	1999, Unit, 370,574 patients	Medical records, Adults	Not reported; however, the authors obtained hierarchical longitudinal linear models (random coefficient regression models)	Restraint use

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type, Data Collection	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Ritter-Teitel, 2001[69] Dissertation, Retrospective	Examine the association between nurse staffing and patient outcomes	Sample from HRIO study ("Hospital Restructuring's Impact on Outcomes") of 42 teaching hospitals, 100%	1997-1998, Unit, 56, Sample bias assessed	Administrative	Age, primary diagnosis and case-mix index, random effects of hospitals	Patient satisfaction, transient ischemic attack, pressure ulcers, falls
Dimick, 2001[70] Article, Retrospective	Determine if nurse-to-patient ratio in the intensive care unit at night is associated with differences in clinical and economic outcomes after hepatectomy	Maryland Health Services Cost Review Commission	1994-1998, Patient, 569 patients, 2.28%	Administrative, Adults, >18 years, hepatic resection	Patient age, sex, nature of admission, type of operation, comorbidity; hospital and surgeon volumes	Mortality, length of stay, pneumonia, pulmonary failure, unplanned extubation, cardiac arrest and CPR, postoperative myocardial infarction, acute renal failure, bloodstream infection
Sovie, 2001[71] Article, Retrospective	Examine the association between nurse staffing and patient outcomes	29 university teaching hospitals based on the MECON-PEERx Operations Benchmarking Database Reports, 100%	Hospital, 29 hospitals	Administrative, Adults	Year of submission and type of unit	Patient satisfaction, urinary tract infection, pressure ulcers, falls

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type, Data Collection	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Pronovost, 2001[72] Article, Retrospective	Evaluate the association between nurse-to-patient ratio in the ICU and risk for medical and surgical complications after abdominal aortic surgery	Health Services Cost Review Commission	1994-1996, Patient, 2,615 patients, 0.34%, Sampling bias assessed	Administrative, Adults, >30 years, Abdominal aortic surgery	Number of hospital beds and the volume of aortic surgery performed during the study period by each hospital and each surgeon in the database; patient age (in years), sex, race, and comorbidities	Mortality, length of stay, pulmonary failure, unplanned extubation, cardiac arrest and CPR, medical complications acute renal failure, septicemia, acute myocardial infarction, surgical complications, reoperation for bleeding, bloodstream infection
Blegen, 2001[73] Article, Retrospective	Describe the relationships between the quality of patient care and the education and experience of the nurses providing that care		1993-1995, Unit, 81 units	Administrative, Adults	Hospital Medicare case mix index	Falls
Aiken, 2002[74] Article, Retrospective	Determine the association between the patient-to-nurse ratio and patient mortality, failure to rescue (deaths following complications) among surgical patients, and factors related to nurse retention	American Hospital Association (AHA) annual survey and 1999 Pennsylvania Department of Health Hospital Survey, 36.2%	1998-1999, Patient, 232,342 patients	Administrative, Adults, >20 years, General surgical, orthopedic, or vascular operation	Patient age, sex, surgery types, comorbidity; hospital size, teaching status, and technology; nurse's sex, years of experience in nursing, education	Mortality, failure to rescue

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type, Data Collection	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Dang, 2002[75] Article, Retrospective	Examine the association between ICU nurse staffing and the likelihood of complications for patients undergoing abdominal aortic surgery	Maryland Health Services Cost Review Commission	1994-1996, Patient, 2,987 patients, 12.76%	Administrative, Adults, 30, Abdominal aortic surgery	Patient age, sex, race, comorbidity, severity of illness, nature of admission, hospital and ICU bed size; hospital and surgeon volume, type of unit, full-time medical director and nurse manager, RN attendance at daily rounds, use of clinical pathways	Pulmonary failure, unplanned extubation, cardiac arrest and CPR, complications: acute myocardial infarction, cardiac complications after a procedure, acute renal failure, platelet transfusion, bloodstream infection
Tourangeau, 2002[76] Article, Retrospective	Examine the association between nursing-related hospital variables and 30-day mortality rates for hospitalized patients	Ontario Hospital Reporting system, 13.3%	1998-1999, Hospital, 46,941 hospitals	Administrative, Adults, >21 years, Acute myocardial infarction, stroke, pneumonia, or septicemia	Patient age, sex, comorbidities, socio-economic status; hospital teaching status, and location	Mortality
Barkell, 2002[77] Article, Retrospective	Examine the effects of a change in the staffing model on length of stay, variable cost, patient satisfaction, incidence of urinary tract infection and pneumonia, and pain management in bowel resection patients	Single hospital study: 508-bed full service community-based teaching hospital	1999-2000, Patient, 96 patients	Medical records, Adults, >18 years, Postoperative bowel procedure	Not reported	Length of stay, patient satisfaction, urinary tract infection, pneumonia

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type, Data Collection	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Stegenga, 2002[78] Article, Retrospective	Examine the relationship between nurse staffing levels and the rate of nosocomial viral gastrointestinal infections (NVGIs) in a general pediatrics population	Single hospital study, general pediatrics ward at The Hospital for Sick Children in Toronto, Ontario, Canada, a 320-bed, tertiary-care pediatric institution	1997-1999, Patient, 2,929 patients	Medical records, Children	Not reported	Nosocomial infection
Alonso-Echanove, 2003[79] Article, Prospective	Examine the association between nurse staffing and bloodstream infections in intensive care units	Part of Detailed ICU Surveillance Component (DISC) Study (prospective, multi center cohort study). 6 hospitals, 8 ICU units	1997-1999, Patient, 8,593 patients	Medical records, Adults, Central venous catheter	Patient age, gender, weight, height, diagnosis, comorbidity	Bloodstream infection
Mark, 2003[80] Article, Prospective	Examine the association between nurse practice and patient outcomes (patient satisfaction, rate of reported medication errors, and falls)	68 randomly selected non-federal, no psychiatric, not-for-profit, accredited acute care hospitals with more than 150 beds in 10 southeastern states, 34%	1995-2000, Patient, 1,326 patients, Random sampling	Survey, Adults	Case mix index, hospital size, technology	Length of stay, patient satisfaction, falls
Unruh, 2003[81] Article, Retrospective	Examine the changes in licensed nursing staff in Pennsylvania hospitals from 1991 to 1997, and to assess the relationship of licensed nursing staff with patient adverse events in hospitals	Pennsylvania Department of Health	1991-1997, Hospital, 83,924 patients, Sampling bias assessed	Administrative, Adults	Patient age, gender, race, ethnic status, and level of severity, ownership status, hospital mergers, number of board-certified physicians, and capacity utilization	Urinary tract infection, pneumonia, pressure ulcers, falls, pulmonary failure, nosocomial infection

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type, Data Collection	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Simmonds, 2003[82] Dissertation, Retrospective	Examine the association between nurse staffing and colonization vancomycin-resistant enterococci colonization in chronic dialysis patients	Single hospital study	2000-2002, Patient, 1,084 patients, 26.11%	Medical records, Chronic renal diseases that requires hemodialysis	Nursing workload index, patient age, and acuity	Nosocomial infection
Tallier, 2003[83] Dissertation, Retrospective	Examine the relationship between nurse staffing and patient outcomes	Single hospital study including 7 nursing units with patients at high risk of acquiring events	2000-2001, Patient, 2,897 patients	Medical records, Adults, >18 years	Not reported	Patient satisfaction, urinary tract infection, pressure ulcers, nosocomial infection
Berney, 2003[84] Dissertation, Retrospective	Examine association between nurse overtime and patient mortality and 6 nurse-sensitive patient outcomes	Hospitals in New York state completed Institutional Cost Reports, 41.2%	1995-2000, Hospital, 10,210,556 patients	Administrative, Adults	Patient age's, race, primary payer, emergency admission, primary diagnosis and comorbidities (DRGs), hospital variables (location, teaching status, unionization, size, margins), clustering patient within hospitals	Mortality, urinary tract infection, gastrointestinal bleeding, pneumonia, shock, failure to rescue, cardiac arrest and CPR, bloodstream infection
Zidek, 2003[85] Dissertation, Retrospective	Examine the association between changes in nurse staffing determined based on a new patient classification system and patient outcomes	Single hospital study: rural acute tertiary care facility	1999-2001, Patient, 5,067 patients	Medical records	Patient age, sex, primary diagnosis, acuity; unit size, organizational leadership	Length of stay, pressure ulcers, falls

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type, Data Collection	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Hope, 2003[86] Dissertation, Retrospective	Examine the relationship between nursing workload and nosocomial infections in acute care hospital	Single hospital study	1998-2000, Patient, 39,481 patients, 37.23%	Administrative	Patient age, gender, and primary diagnosis, severity of illness; ward type, national risk of infection; resource intensity weight	Urinary tract infections, pneumonia, nosocomial infection, surgical wound infection, bloodstream infection
Cimiotti, 2004[87] Dissertation, Prospective	Examined the association between nurse staffing, healthcare-associated infection, and length of stay among infants in the neonatal ICU	Two Level III-IY neonatal ICU units in New York City participated in a clinical trial to test hygiene regimens	2001-2003, Patient, 2,675 patients	Medical records, Children	Patient acuity based on DRG and nursing Intensity weight; use of surgery and invasive medical devices, birth weight, differences in practices in study's sites	Length of stay, nosocomial infection
Person, 2004[88] Article, Retrospective	Assess the association of nurse staffing with in-hospital mortality for patients with acute myocardial infarction	Cooperative Cardiovascular Project (CCP) dataset, 39.2%	1994-1995, Patient, 234,754 patients, 49.33%, Random	Administrative, Adults, >65 years, Acute myocardial infarction, Medicare	Patient age, gender, ethnicity, and severity of illness, hospital volume, rural/urban location, and teaching status	Mortality
Mark, 2004[89] Article, Retrospective	Examine the effects of change in registered nurse staffing on change in quality of care	American Hospital Association	1990-1995, Hospital, 422 patients, Random	Administrative	Patient's age, gender, admission type, admission source, and type of treatment (medical vs. surgical); hospital size, case mix, and the availability of high technology services	Mortality, urinary tract infection, pneumonia, pressure ulcers

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type, Data Collection	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Mark, 2005[90] Article, Retrospective	Examine structural differences in the relationship between nurse staffing and quality of care in different levels of managed care penetration	Longitudinal cohort of the Healthcare Cost and Utilization Project (HCUP) National Inpatient Sample (NIS); a 20% probability sample of U.S. community hospitals from 11 states, 0.122%, 3.26%	1990-1995, Hospital, 422 hospitals, Random sampling, Sampling bias assessed	Administrative	Patient's age, gender, admission type, admission source, and type of treatment (medical vs. surgical), hospital size, case mix, and the availability of high technology services	Mortality, length of stay
Stratton, 2005[91] Dissertation, Retrospective	Relationships between pediatric nurse staffing and 5 indicators of quality care (measured as adverse occurrence rates) in 17 medical/surgical, 5 oncology, and 12 intensive care units	Seven, academic, not-for-profit children's hospitals from the National Association of Children's Hospitals and Related Institutions (NACHRI), 100%, 0%, Different % HMO penetration	2002, Unit, 6,011 patients	Administrative, Children, >1year	Patient age, sex, race, socio economic status, unit/hospital type, size, and occupancy, transfers, technological complexity, organizational factors including care model, length of shift, flexible staffing, self-governance, paid continuing nursing education, relationships with physicians	Length of stay, patient satisfaction, nosocomial infection

Table G1. Design, external, and internal validity of the studies that examined the associations between nurse staffing and strategies and patient outcomes (continued)

Author, Year, Publication Type, Data Collection	Aim of the Study	Hospital Eligibility Criteria, Database, % of Teaching Hospitals, % of Hospitals for Profit, % of HMO	Time, Analytic Units, Sample Size, % Excluded from Analysis Sampling, Assessment of Sampling Bias	Patient Eligibility Criteria: Database, Population, Age, Diagnosis, Medical Care	Adjustment for Confounding Factors	Outcomes
Elting, 2005[92] Article, Retrospective	Examine the association between nurse staffing (RN/patient ratio) and patient mortality and complication after cystectomy	Texas Hospital Discharge Public Use Data	1999-2001, Hospital, 1,302 hospitals	Administrative, Adults, Bladder carcinoma (ICD-9 codes 188.0-188.9 and 236.7) after total cystectomy	Age, gender, race, ethnicity, comorbidities, and distance from the closest high-volume hospital	Mortality, bacteremia, wound infections, pulmonary compromise, pneumonia, deep venous thrombosis, pulmonary embolus, reoperation, postoperative coma or shock, acute myocardial infarction, arrhythmia, and cardiac arrest or shock
Seago, 2006[93] Article, Retrospective	Examine the association between nurse staffing and patient outcomes for 3 adult medical-surgical nursing units in one university teaching hospital across 4 years (16 fiscal quarters)	Single hospital study, 100%	1999-2002, Patient, 1,012 patients	Administrative, Adults	Case-mix	Patient satisfaction, failure to rescue, pressure ulcers, falls

CNS = Central Nervous System; CPR = Cardio-pulmonary Resuscitation; DRG = Diagnosis Related Group; HMO = Health Maintenance Organization; ICU = Intensive Care Unit; MedPAR = Medicare Provider Analysis Review; RN = Registered Nurse

Table G2. Calculated change in hospital-related mortality corresponding to an increase by one patient/RN, LPN/shift (results from individual studies)

Definition of Nurse to Patient Ratio	Source to Measure Ratio	Author	Increase by One Patient/RN/Shift				Increase by One Patient/LPN/Shift			
			Death Rate	p Value	RR	p Value	Death Rate	p Value	RR	p Value
RN/patient day	Survey of RNs	Aiken[5]			1.83	NS				
Patients/RN/shift	Survey of RNs	Aiken[39]	0.11	<0.05	1.06	<0.05				
Patients/RN/shift	Survey of RNs	Aiken[74]			1.08	<0.05				
Patients/RN/shift	Survey of ICU directors	Amaravadi[64]	4.7	NS	1.2	NS				
Nurse/patient day	AHA and HCFA data bases	Bond[60]						NS		
Patients/RN/shift	Survey of ICU directors	Dimick[70]				NS				
RN, LPN FTE/ number of occupied beds	Hospital Cost Report Information System, Provider of Services files, and the American Hospital Association Survey	Elting[92]	0.42	NS	1.18	<0.05	1.12	<0.05		
Patients/RN/shift	Survey of staff nurses; daily staffing plans and unit census records	Halm[51]			0.99	NS				
RN, LPN FTE/1,000 patient days	Area Resource Files, American Hospital Association Annual Survey, CMS Wage Rate File, CMS Online Survey	Mark[90]			1.001	NS				NS
RN, LPN FTE/1,000 patient days	Area Resource Files, American Hospital Association Annual Survey, CMS Wage Rate File, CMS Online Survey	Mark[89]			1	NS				NS
RN, LPN FTE/ patient day	CCP and AHA datasets	Person[88]	1.41	NS	1.1	<0.05		NS		NS
Patients/RN/shift	Survey of ICU directors	Pronovost[72]	0.5	NS						
Patients/RN/shift	Survey of ICU directors	Pronovost[61]			1.9	<0.05				
RN FTE/patient day	AHA database	Robertson[62]			1.02	<0.05				
Patients/RN/shift	Hospital administrative databases; survey of nursing directors in each unit	Shortell[94]				NS				
Patients/RN/shift	AHA Annual Surveys for 1991–1993, and the Pennsylvania Health Care Cost Containment Council Data Base for years 1991–1994	Silber[67]			1.05	<0.05				
RN, LPN FTE/ 1,000 patient days	State Department of Health, AHA database	Unruh[66]	-1.4	<0.05			0.14	<0.05		

LPN = Licensed Practical Nurse; NS = Not Significant; RN = Registered Nurse; RR = Relative Risk

Table G3. Evidence of the association between nurse staffing and mortality

Author, Source to Measure Mortality, Definition of Mortality	Source to Measure Nurse Staffing, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Mortality
Pronovost, 2001[72] The Uniform Health Discharge Data Set In-hospital mortality from all causes	Survey to the ICU directors, An average ICU nurse-to-patient ratio during the day and evening	Mean age 68 years, 89% whites, 66% males, 11-13% emergency admissions, Units: ICU Patients: surgical	More nurses: RN/patient 1:1 or 1:2 (7 hospitals) Fewer nurses: RN/patient 1:3 or 1:4 (31 hospitals)	Crude rate % ± SD 7 ± 26 8 ± 36
Pronovost, 1999[61] The Uniform Hospital Health Discharge Data Set In-hospital mortality	Survey of intensive care unit directors, An average nurse to patient ratio in day and in evening; decreased nurse to patient ratio in evening	Mean age 68 years, 89% whites, 66% males, 11-13% emergency admissions, Units: ICU Patients: surgical	Decreased nurse to patient ratio in evening (7 hospitals) Nurse to patient ratio >1:2 in evening (31 hospitals)	Relative risk (95% CI) 1.9 (1.2; 3) Reference
Amaravadi, 2000[64] The Uniform Health Discharge Data Set In-hospital mortality	Survey of ICU directors, An average nurse-to-patient ratio during the day and at night	32 hospitals Units: ICU Patients: surgical Age % Whites Males 63 77 70 60 83 79 60 83 79 63 77 70	 Night time nurse to patient ratio >1:2 Night time nurse to patient ratio <1:2 Night time nurse to patient ratio >1:2 Night time nurse to patient ratio <1:2	 Relative Risk (95% CI) 0.7 (0.3;2) Reference Crude rate % 5.6 15
Dimick, 2001[70] The Uniform Health Discharge Data Se In-hospital mortality	Survey of ICU directors, An average nurse-to-patient ratio in the ICU during the day and evening and at night	Units: ICU Patients: surgical Age % Whites Males 56 82 51 57 67 55	 More nurses: RN/patient 1:1-1:2 (8 hospitals) Fewer nurses: RN/patient 1:3-1:4 (25 hospitals)	 Relative risk (95% CI) Reference 0.49 (0.18;1.29)

Table G3. Evidence of the association between nurse staffing and mortality (continued)

Author, Source to Measure Mortality, Definition of Mortality	Source to Measure Nurse Staffing, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Mortality
Blegen, 1998[59] Hospital records Death rates per 1,000 patient days. All deaths, whether expected, unexpected, procedure-related, or do not resuscitate, were included	A record of hours worked for each individual employee was completed by the staffing clerk and approved by the employee and nurse manager before being entered into the computerized payroll database. The hours of care per patient day from all nursing personnel: Hours of direct patient care by RNs, LPNs, and nursing assistants each month divided by the patient days of care on the unit for the month. The hours of direct patient care from RNs divided by patient days excluding hours for non patient care (meetings, vacation, sick leave, and holidays)	Single hospital study, 42 units	Increase by 1% in proportion of RN nurses Proportion of RN >87.5% Increase by 1 hour in total nursing hours Mean nurse staffing Total nursing hours 10.7, RN hours 7.7	Changes in death rate/100 patient days -0.36 ± 1.64 0.14 ± 0.53 0.02 ± 0.07 Death Rate 0.06
Aiken, 1999[5] Medical charts of consecutively admitted patients Mortality within 30 days from admission	Survey of all registered and licensed practical nurses who worked at least 16 hours per week The average number of nurses per patient day (self-reported) Nurse autonomy: nurse control over the practice environment across hospital units (Clinical Environment Index)	Hospitals Units 20 40 5 8 5 8 5 8 20 40 Age % Whites Males 37 47 88 39 29 77 37 45 87	Increase by 1 RN/patient Dedicated AIDS units AIDS hospital-scattered bed units Conventional scattered bed units Nurse control over practice setting Increase by 1 RN/patient Dedicated AIDS units AIDS hospital-scattered bed units	Relative risk (95% CI) 0.43 0.24 0.78 1.06 0.59 1.9 0.69 0.34 1.41 1 1 1 1.03 0.94 1.13

Table G3. Evidence of the association between nurse staffing and mortality (continued)

Author, Source to Measure Mortality, Definition of Mortality	Source to Measure Nurse Staffing, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Mortality
Aiken, 2003[39] Discharge abstracts Deaths within 30 days of hospital admission	Surveys of hospital nurses (the Pennsylvania Board of Nursing) The mean number of patients assigned to all staff nurses who reported caring for at least 1 but fewer than 20 patients on the last shift they worked; highest credential in nursing: a hospital school diploma, an associate degree, a bachelor's degree, a master's degree, or another degree; the mean number of years of experience working as an RN for nurses from each hospital	Units: ICU Patients: surgical Hospitals 53 34 168 19 26 36	 Increase by 1 year in nurse experience Increase in workload of 1 patient 10% increase in nurses with BSN degree 40% of hospital workforce with BSN or higher, 4 patients/nurse 20% of hospital workforce with BSN or higher, 4 patients/nurse 60% of hospital workforce with BSN or higher, 6 patients/nurse 40% of hospital workforce with BSN or higher, 6 patients/nurse 20% of hospital workforce with BSN or higher, 6 patients/nurse 60% of hospital workforce with BSN or higher, 4 patients/nurse 20-29% of hospital workforce with BSN or higher <20% of hospital workforce with BSN or higher 20% of hospital workforce with BSN or higher, 8 patients/nurse >50% of hospital workforce with BSN or higher 40-49% of hospital workforce with BSN or higher 30-39% of hospital workforce with BSN or higher 40% of hospital workforce with BSN or higher 60% of hospital workforce with BSN or higher, 8 patients/day	Relative risk (95% CI) 1 0.98 1.02 1.06 1.01 1.1 0.95 0.91 0.99 Mortality rate/100 patients 1.8 1.97 1.8 1.98 2.16 1.64 2.2 2.3 2.38 1.7 1.9 1.8 2.17 1.98

Table G3. Evidence of the association between nurse staffing and mortality (continued)

Author, Source to Measure Mortality, Definition of Mortality	Source to Measure Nurse Staffing, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Mortality
Aiken, 2002[74] Hospital data (Health Care Cost Containment Council Death within 30 days of hospital admission	Survey of 50% random sample of registered nurses who were on the Pennsylvania Board of Nursing rolls; Burnout: the Emotional Exhaustion scale of the Maslach Burnout Inventory Scale Nurse' job satisfaction: 4-point scale from very dissatisfied to very satisfied	Patients Surgical Hospitals 168 % males 44 Mean age 44 years	Increase by 6 patients/nurse Increase by 1 patient/nurse Increase by 8 patients/nurse Increase by 4 patients/nurse	Relative risk (95% CI) 1.5 1.19 1.97 1.07 1.03 1.12 1.72 1.27 2.48 1.31 1.13 1.57
Person, 2004[88] Medicare database In-hospital mortality and within 30 days of hospital admission	AHA Survey The ratio of full-time equivalent RNs to average daily census (ADC) categorized by their respective quartiles of nurse to ADC ratio; the ratio of full-time equivalent licensed practical nurses (LPNs) to ADC categorized by their respective quartiles of nurse to ADC ratio; ratio of RNs to LPNs	Hospitals 4,401 Age % Whites Males 77 90 50	Skill Mix: % of RN 1 quartile of LPN staffing 1 quartile of LPN staffing 1 quartile of RN staffing 1 quartile of RN staffing 2 quartiles of LPN staffing 2 quartiles of LPN staffing 2 quartiles of RN staffing 2 quartiles of RN staffing 3 quartiles of LPN staffing 3 quartiles of LPN staffing 3 quartiles of RN staffing 3 quartiles of RN staffing 4 quartiles of LPN staffing 4 quartiles of LPN staffing 4 quartiles of RN staffing 4 quartiles of RN staffing 1 quartile of LPN staffing 1 quartile of RN staffing 2 quartiles of LPN staffing 2 quartiles of RN staffing 3 quartiles of LPN staffing 3 quartiles of RN staffing 4 quartiles of LPN staffing 4 quartiles of RN staffing	Mortality Rate 23.9 20 20.1 23.3 17.9 20.9 21.6 18.6 20.1 22.1 17.4 20.5 17.2 18.7 21.5 17.8 Relative Risk (95% CI) 1 1 1 1 1 1 1 0.94 1.07 0.96 0.9 1 1.02 0.96 1.09 0.94 0.88 1 1.07 1 1.15 0.91 0.86 0.97

Table G3. Evidence of the association between nurse staffing and mortality (continued)

Author, Source to Measure Mortality, Definition of Mortality	Source to Measure Nurse Staffing, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Mortality		
Berney, 2003[84] The New York Statewide Planning and Research Cooperative System In-hospital mortality	The New York State Institutional Cost Reports RN total hours in inpatient cost units/patient-days in units adjusted for nursing acuity, RN acute hours/ (RN+LPN acute hours); % of total RN hours paid as overtime hours; Union: RN are represented by unions as reported in ICR	Hospitals: 161 Surgical Medical Surgical Medical Medical Medical Surgical Surgical	 1% increase in RN overtime work 1 hour increase in RN hours/acute patient day 1% increase in RN hours/total licensed hours 1st (low overtime) quartile 4th (high overtime) quartile 1% increase in RN overtime work 1st (low overtime) quartile 4th (high overtime) quartile	Relative risk (95% CI) 0.99 0.98 1.01 0.98 0.97 0.99 0.97 0.95 0.98 0.99 0.98 1.00 1.00 1.00 1.00 1.00 0.99 1.00 0.99 0.98 1.00 1.00 1.00 1.00	
Needleman, 2001[28] 799 hospitals (11 states, all-patients + Medicare patients) – hospital level analysis; 256 California hospitals (part of the 11 state sample) – unit level analysis; National sample of 3,357 hospitals (Medicare patients) –hospital level analysis; in-hospital mortality	State hospital financial reports or hospital staffing surveys; the American Hospital Association Annual Survey of hospitals (2,080 hours * each FTE category) + (1,040 hours * number of part-time employees). Total nursing hours/patient-day NIW adjusted; RNs, clinical nurse specialists, general duty nurses, nurse practitioner excluding nursing directors, managers, administrators, supervisors, instructors, anesthetists, and midwifes. RN hours/patient day NIW adjusted. Licensed hours/patient-day NIW adjusted LPN/LVN, excluding the director of nursing. LPN/LVN hours/patient-day NIW adjusted Nursing aides, orderlies and attendants, excluding	4,156 hospitals	 Increase by 1 hour of RN hours in medical patients Increase by 1 hour in RN hours in surgical patients Increase by 1 hour in LPN hours in medical patients Increase by 1 hour in LPN hours in surgical patients Increase by 1 hour in aide hours in medical patients Increase by 1 hour in aide hours in surgical patients Increase by 1 hour in total nursing hours in medical patients Increase by 1 hour in total nursing hours in surgical patients Increase by 1% in RN/total nursing hours in medical patients Increase by 1% in RN/total nursing hours in surgical patients Increase by 1 hour in licensed hours/patient-day in medical patients Increase by 1% of RN hours/total licensed hours per patient day in medical patients Increase by 1 hour in licensed hours/patient-day in surgical patients Increase by 1% in RN hours/total	Relative risk (95% CI) 1.00 0.99 1.01 1.00 0.99 1.01 1.01 0.99 1.03 1.00 0.96 1.04 1.01 1.00 1.02 1.07 1.04 1.09 1.00 1.00 1.01 1.00 0.99 1.01 0.87 0.71 1.05 0.96 0.68 1.35 1.00 0.99 1.01 0.90 0.74 1.09 1.00 0.99 1.01 0.99 0.67 1.47	

Table G3. Evidence of the association between nurse staffing and mortality (continued)

Author, Source to Measure Mortality, Definition of Mortality	Source to Measure Nurse Staffing, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Mortality		
	ward clerks. Total aide hours/patient day NIW adjusted RN hours per day/total hours per day; RN hours/licensed hours = RN hours per day/licensed hours per day (RN + LPN)		licensed hours per patient-day in surgical patients			
			Increase by 1 hour in RN hours in medical patients	1.00	1.00	1.01
			Increase by 1 hour in LPN hours in medical patients	1.00	0.99	1.01
			Increase by 1 hour in licensed hours in medical patients	1.00	1.00	1.00
			Increase by 1% in RN hours/total licensed hours in medical patients	0.98	0.89	1.08
			Increase in total nurse hours in medical patients	1.00	1.00	1.01
			Increase by 1% in RN hours/total nurse hours in medical patients	0.84	0.71	1.01
			Increase by 1 hour in aide hours in medical patients	1.01	1.00	1.02
			Increase by 1 hour in RN hours in surgical patients	0.98	0.95	1.00
			Increase by 1 hour in LPN in surgical patients	1.01	1.00	1.02
			Increase by 1 hour in licensed hours in surgical patients	1.00	0.99	1.00
			Increase by 1% in RN hours/licensed hours in surgical patients	0.88	0.75	1.03
			Increase by 1 hour in aide hours in surgical patients	1.00	0.98	1.03
			Increase by 1 hour in total nursing hours	1.00	0.99	1.01
			Increase by 1% in RN hours/total nursing hours	1.02	0.70	1.48
			Increase by 1 hour in RN hours in medical patients, hospital level analysis, California hospitals	0.98	0.97	0.99
			Increase by 1 hour in LPN hours in medical patients, hospital level analysis, California hospitals	0.98	0.94	1.02
			Increase by 1 hour in aide hours in medical patients, hospital level analysis, California hospitals	1.02	1.00	1.04
			Increase by 1 hour in total nursing	0.87	0.81	0.94

Table G3. Evidence of the association between nurse staffing and mortality (continued)

Author, Source to Measure Mortality, Definition of Mortality	Source to Measure Nurse Staffing, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Mortality		
			hours in medical patients, hospital level analysis, California hospitals			
			Increase by 1% in RN hours/total nursing hours in medical patients, hospital level analysis, California hospitals	0.59	0.45	0.78
			Increase by 1 hour of licensed nursing hours in medical patients, hospital level analysis, California hospitals	0.98	0.97	1.00
			Increase by 1% of RN hours/total licensed hours in medical patients, hospital level analysis, California hospitals	0.91	0.65	1.27
			Increase by 1 hour of RN hours in medical patients, unit level analysis, California hospitals	0.98	0.96	1.00
			Increase by 1 hour in LPN hours in medical patients, unit level analysis, California hospitals	0.98	0.94	1.02
			Increase by 1 hour in aide hours/patient day in medical patients, unit level analysis, California hospitals	1.28	1.06	1.54
			Increase by 1 hour in total nursing hours in medical patients, unit level analysis, California hospitals.	0.81	0.72	0.90
			Increase by 1% in RN hours/total nursing hours in medical patients, unit level analysis, California hospitals	0.60	0.46	0.78
			Increase by 1 hour of total licensed hours in medical patients, unit level analysis, California hospitals	0.98	0.96	1.00
			Increase by 1% of RN hours/licensed hours in medical patients, unit level analysis, California hospitals	0.89	0.68	1.16
			Increase by 1 hour of RN hours in surgical patients, hospital level analysis, California hospitals	1.02	1.00	1.04
			Increase by 1 hour in LPN hours in	1.07	0.97	1.17

Table G3. Evidence of the association between nurse staffing and mortality (continued)

Author, Source to Measure Mortality, Definition of Mortality	Source to Measure Nurse Staffing, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Mortality		
			surgical patients, hospital level analysis, California hospitals			
			Increase by 1 hour in aide hours in surgical patients, hospital level analysis, California hospitals	1.01	0.96	1.06
			Increase by 1 hour in total nursing hours in surgical patients, hospital level analysis, California hospitals	1.02	1.00	1.04
			Increase by 1% in RN hours/total nursing hours in surgical patients, hospital level analysis, California hospitals	1.29	0.74	2.26
			Increase by 1 hour in licensed hours in surgical patients, hospital level analysis, California hospitals	1.03	1.00	1.05
			Increase by 1% in RN hours/licensed hours in surgical patients, hospital level analysis, California hospitals	0.76	0.34	1.69
			Increase by 1 hour of RN hours in surgical patients, unit level analysis, California hospitals	1.04	1.01	1.07
			Increase by 1 hour in LPN hours in surgical patients, unit level analysis, California hospitals	1.06	0.96	1.16
			Increase by 1 hour in aide hours in surgical patients, unit level analysis, California hospitals	0.98	0.92	1.03
			Increase by 1 hour in total nursing hours in surgical patients, unit level analysis, California hospitals	1.02	1.00	1.05
			Increase by 1% in RN hours/total nursing hours in surgical patients, unit level analysis, California hospitals	1.69	1.02	2.81
			Increase by 1 hour in licensed hours in surgical patients, unit level analysis, California hospitals	1.04	1.01	1.07
			Increase by 1% in RN hours/ licensed hours in surgical patients, unit level analysis, California hospitals	0.86	0.46	1.61

Table G3. Evidence of the association between nurse staffing and mortality (continued)

Author, Source to Measure Mortality, Definition of Mortality	Source to Measure Nurse Staffing, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Mortality
Seago, 2002[34] The California Office of Statewide Health Planning and Development (OSHPD) Hospital Disclosure Report database; the California Vital Statistics data set from the California Department of Human Services (DHS), mortality within 30 days of hospital admission	The California Office of Statewide Health Planning and Development (OSHPD) Hospital Disclosure Report database; the National Labor Relations Board, number of RN hours/acute myocardial infarction (AMI) related discharge; the presence of a bargaining unit for registered nurses	Hospitals 106 238 343 343 343 343	 Union hospitals Not union hospitals Union vs. not union 5 RN hour/AMI discharge 1 RN hour/AMI discharge 8 RN hour/AMI discharge	Mortality Rate ± SD 14.4 ± 3 15.2 ± 3.5 Relative risk 0.43 0.89 0.97 0.834
Estabrooks, 2005[50] Hospital Inpatient Database; Alberta Health Care Insurance Plan Registry (AHCIPR) was linked to identify persons who died within 30 days of admission Mortality within 30 days of hospital admission	Survey of RN (Alberta Association of Registered Nurses registry) working in acute care hospitals Self-reported % of RNs to total nursing staff, Self reported highest RN credential: Diploma; Baccalaureate; Masters; Otherwise; % of BSN in hospital level derived from the question regarding the highest degree; Nurse job satisfaction: responses for the question: "On the whole, how satisfied are you with your job?" 1. Very dissatisfied 2. A little dissatisfied 3. Moderately satisfied 4. Very satisfied) Nurse autonomy: freedom to make important patient care and work decisions	49 hospitals	 Hospitals with lower proportion of temporary nurses Hospitals with higher proportion of nurses with BSN Hospitals with lower proportion of nurses with BSN Hospitals with higher proportion of temporary nurses Hospitals with lower proportion of RN Hospitals with lower proportion of RN Hospitals with higher proportion of RN Hospitals with lower proportion of temporary nurses Hospitals with higher proportion of temporary nurses Hospitals with higher proportion of RN Hospitals with lower proportion of nurses with BSN Hospitals with higher proportion of nurses with BSN	Relative risk (95% CI) 1 1 1 0.81 0.68 0.96 1 1 1 1.47 1.21 1.79 1 1 1 1 1 1 0.76 0.66 0.87 1 1 1 1.26 1.09 1.47 0.83 0.73 0.96 1 1 1 0.65 0.6 0.71

Table G3. Evidence of the association between nurse staffing and mortality (continued)

Author, Source to Measure Mortality, Definition of Mortality	Source to Measure Nurse Staffing, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Mortality
Cho, 2003[38] Hospital Financial Data, in hospital mortality	The State Inpatient Databases, the total productive hours worked by all nursing personnel per patient day, the total productive hours by registered nurses per patient day	Mean age 68 years % Whites 79.3 Males 48.9% Hospitals 12 79 48 48	 Large non-profit teaching hospitals, 76.5% RN Medium, non-profit, non-teaching, non-rural, 68.1% RN Large, non-profit, non-teaching, non-rural 72.4% RN Medium, investor-owned non-teaching non-rural hospitals, 72.7% RN	Death Rate ± SD 5.13 ± 2.73 4.4 ± 2.18 4.22 ± 1.5 4.45 ± 2.31
Elting, 2005[92] The Texas Hospital Discharge Public Use Data File linked to the 2000 U.S. Census, In-hospital mortality	Hospital Cost Report Information System, Provider of Services files, and the American Hospital Association Survey, number of LPN/mean annual number of occupied bed days, number of RN/mean annual number of occupied bed days	Patients Surgical 58 75 75 58 75 58 58 75	 Hospitals with few LPNs/occupied bed (median 0.7) Hospitals with many LPNs/occupied bed (median 3.1) Hospitals with many RNs/occupied bed (median 3.1) Hospitals with few RNs/occupied bed (median 1.4) Hospitals with many RNs/occupied bed (median 3.1) Hospitals with few RNs/occupied bed (median 1.4) Hospitals with few RNs/occupied bed (median 1.4) Hospitals with many RNs/occupied bed (median 3.1)	Death rate 2.3 3.1 0.7 1.9 1.9 4.5 Relative risk (95% CI) 4.41 1 1 1 1.6 0.43 0.19 0.97

Table G3. Evidence of the association between nurse staffing and mortality (continued)

Author, Source to Measure Mortality, Definition of Mortality	Source to Measure Nurse Staffing, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Mortality
Tourangeau, 2002[76] Discharge abstract database linked to the Ontario Registered Persons Database, mortality within 30 days of hospital admission	The Ontario Registered Nurse Survey of Hospital Characteristics and Ontario Hospital Reporting System Total nursing staff worked hours per Ontario case weight RN inpatient hours/other nursing staff earned hours (RN + LPN + aide); number of years employed in the current clinical unit	75 hospitals	Increase by 1 year in nursing experience in teaching hospitals Increase by 10% proportion of RN/total nursing personnel Increase by 1 year in nursing experience in non-urban hospitals Increase by 1 year in experience 30 days mortality in teaching hospitals (85% RN) 30 days mortality in non-urban community hospitals (71% RN) 30 days mortality in urban community hospitals (79% RN)	Relative risk 0.99 0.95 1.00 0.99 14.02 15.27 15.05
Mark, 2005[90] Centers for Medicare and Medicaid Services Minimum Cost and Capital File, CMS Provider of Services File, CMS Case Mix Index File, CMS Online Survey; Certification and Reporting system (OSCAR) files, and HCUP files In-hospital mortality	The Area Resource Files, American Hospital Association Annual Survey, CMS Wage Rate File, CMS Online Survey Certification and Reporting system (OSCAR) files RN FTEs/1,000 in-patient days RN hours/patient * day = (FTE RN/1,000 patient * days * 37.5 * 48)/1,000; 37.5 hour work week on average 48 working weeks/year LPN FTEs/1,000 in-patient days LPN hours/patient * day = (FTE LPN /1,000 patient * days * 37.5 * 48)/1,000; 37.5 hour work week on average 48 working weeks/year	Hospitals 353 362 362 360 422	Lowest quartile of HMO penetration Second quartile of HMO penetration Third quartile of HMO penetration Highest quartile of HMO penetration Increase by 1 RN FTE/1,000 patient days in hospitals with high HMO penetration Increase by 1 LPN FTE/1,000 patient days in hospitals with high HMO penetration Increase by 1 RN FTE/1,000 patient days in hospitals with low HMO penetration Increase by 1 LPN FTE/1,000 patient days in hospitals with low HMO penetration 25th Quartile of RN FTE/1,000 patient days with high HMO penetration 50th Quartile of RN FTE/1,000 patient days with high HMO penetration 75th Quartile of RN FTE/1,000 patient days with high HMO penetration 25th Quartile of RN FTE/1,000 patient days with low HMO penetration 50th Quartile of RN FTE/1,000 patient	Relative risk (95% CI) 0.99 0.97 1.02 1.03 1.00 1.05 0.99 0.96 1.01 1.01 0.99 1.04 0.91 0.86 0.95 1.02 0.90 1.16 1.01 0.86 1.18 0.82 0.55 1.23 0.97 0.96 0.99 0.99 0.97 1.00 1.00 0.99 1.02 0.97 0.93 1.01 0.97 0.93 1.01

Table G3. Evidence of the association between nurse staffing and mortality (continued)

Author, Source to Measure Mortality, Definition of Mortality	Source to Measure Nurse Staffing, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Mortality
			days with high HMO penetration	
			75th Quartile of RN FTE/1,000 patient days with low HMO penetration	0.97 0.91 1.03
			Reference 1 patient/FTE nurse	1.00 1.00 1.00
Robertson, 1999[62] HCFA database and Hospitals Information Reports, mortality within 30 days of hospital admission	The American Hospital Association database, hospital average of RN FTE/100 adjusted submissions, hospital average of LPN FTE/100 adjusted submissions, hospital average of aide FTE/100 adjusted submissions	Hospitals		Relative risk
		1,791	Increase by 1 aide in aide/patient ratio in 1989	0.98
		2,133	Increase by 1 aide in aide/patient ratio in 1991	1.02
		1,791	Increase by 1 LPN in LPN/patient ratio in 1990	0.92
		1,784	Increase by 1 LPN in LPN/patient ratio in 1989	0.92
		2,133	Increase by 1 RN in RN/patient ratio in 1990	0.99
		2,133	Increase by 1 RN in RN/patient ratio in 1989	0.99
		2,133	Increase by 1 RN in RN/patient ratio in 1991	0.98
		2,133	Increase by 1 UAP aide/patient ratio in 1990	1.04
		2,133	Increase by 1 LPN in LPN/patient ratio in 1991	1.01

Table G3. Evidence of the association between nurse staffing and mortality (continued)

Author, Source to Measure Mortality, Definition of Mortality	Source to Measure Nurse Staffing, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Mortality
Needleman, 2003[43] Hospital discharge data In-hospital mortality	The American Hospital Association's Annual Survey of Hospitals, Total licensed hours (RN + LPN) / adjusted patient day; RN hours / adjusted patient day calculated from FTE in hospital (2,080 hours, 52 weeks at 40 hours/ week) LPN hours / adjusted patient day calculated from FTE in hospital (2,080 hours, 52 weeks at 40/week). UPA hours/adjusted patient day calculated from FTE in hospital (2,080 hours, 52 weeks at 40/week). the proportion of hours of care by RN/licensed nurses (RN + LPN)	799 hospitals Units Medical Surgical Medical Surgical Surgical Medical	 1% increase in RN hours/total licensed hours (RN + LPN) Increase in 1 hour of RN in surgical patients Increase in 1 hour of RN in medical patients 1% increase in proportion of RN/total nursing personnel Surgical patients in 799 hospitals (68% RN) Medical patients in 799 hospitals 68% RN)	Relative risk (95% CI) 0.9 0.74 1.09 1 0.99 1.01 1 0.99 1.01 0.99 0.67 1.47 Death rate 1.6 3.2
Hartz, 1989[11] Hospital discharges data from The Health Care Financing Administration (HCFA) Mortality within 30 days of hospital admission	The American Hospital Association's 1986 annual survey of hospitals Proportion of RN/total nursing personnel in hospital	3,100 hospitals	 Hospitals with high proportion of RNs (upper quartile, 61%) Hospitals with high proportion of RNs (upper quartile, 61%) Hospitals with lower proportion of RNs (lower quartile, 59%) Hospitals with lower proportion of RNs (lower quartile, 59%) Hospitals with 59% of RNs Hospitals with 61% of RNs	Death rate 11.31 adjusted for severity 11.1 crude 11.94 adjusted for severity 12.16 crude 11.75 fully adjusted 11.5 fully adjusted

Table G3. Evidence of the association between nurse staffing and mortality (continued)

Author, Source to Measure Mortality, Definition of Mortality	Source to Measure Nurse Staffing, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Mortality
Krakauer, 1992[12] Medical records for all Medicare discharges, a random sample of 700 discharges were abstracted from the stratum that included hospitals with 700 or more discharges Mortality within 30 days of hospital admission	1986 American Hospital Association (AHA) survey, the proportion of registered nurses/total nursing personnel	84 hospitals Age 72.3 years, Whites 84%, Males 46%	Lower quartile of % of RN, claims model Upper quartile of % RN, claims model Lower quartile of % RN, clinical model Upper quartile of % RN, clinical model	Death rate 15.7 12.1 14.9 12.8
Aiken, 1994[7] HCFA database Mortality within 30 days of hospital admission	1988 AHA annual survey of hospitals % of RN/total nursing personnel	79 hospitals	Control hospitals, 70.8 % RN Control hospitals, 67.1% RN Magnet hospitals, 76% RN Control hospitals, 69.2% RN Control hospitals, 69% RN Control hospitals, 68.2% RN	Death rate 0.111 0.116 0.105 0.117 0.109 0.117
Shortell, 1988[54] MedPAR dataset of hospital discharges In-hospital mortality	Database of the larger study of 8 multi-hospital systems Proportion of RN/total hospital employee	981 hospitals	Increase by 1% in RN/total hospital staff	Relative risk (95% CI) 0.73 (0.48;1.1)
Mark, 2004[89] The Healthcare Cost and Utilization Project (HCUP) National Inpatient Sample (NIS) In-hospital mortality	American Hospital Association Annual Survey, Online Survey Certification and Reporting System [OSCAR] RN FTEs/1000 inpatient days RN hours/patient * day = (FTE RN/1,000 patient*days * 37.5 * 48)/1000 LPN FTEs/1,000 inpatient days LPN hours/patient * day = (FTE LPN/1000 patient * days * 37.5 * 48)/1,000	Hospitals 357 361 361 366 373 357 357 357 357 422 422 422	RN hours/patient day Year 1993 6.05 Year 1994 6.30 Year 1992 5.76 Year 1992 5.65 Year 1990 5.44 75th quartile of RN FTE/1,000 patient days, 7.24 RN hours/patient day 50th quartile of RN FTE/1,000 patient days, 6.01 RN hours/patient day 25th quartile of RN FTE/1,000 patient days, 4.79 RN hours/patient day Year 1995 6.48 RN hours Increase by 1 RN FTE/patient day Increase by 1 LPN FTE/patient day Reference 1 RN and LPN FTE/patient day	Relative Risk (95% CI) 1.05 1.02 1.08 0.97 0.94 1.00 1.09 1.06 1.12 1.15 1.12 1.18 1.20 1.17 1.23 0.96 0.95 0.98 0.97 0.96 0.98 0.98 0.96 0.99 0.90 0.87 0.93 0.92 0.87 0.96 1.01 0.97 1.06 1.00 1.00 1.00

Table G3. Evidence of the association between nurse staffing and mortality (continued)

Author, Source to Measure Mortality, Definition of Mortality	Source to Measure Nurse Staffing, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Mortality
Silber, 2000[67] Pennsylvania Medicare claims records; the Medicare Standard Analytic Files; random sample of 50% of Medicare patients who underwent general surgical or orthopedic procedures Mortality within 30 days of hospital admission	The American Hospital Association Annual Surveys for 1991–1993, and the Pennsylvania Health Care Cost Containment Council Data Base for years 1991–1994 RN/bed ratio at hospital level	Hospitals Units 245 Surgical 258 Surgical 258 Surgical 258 Surgical	 Hospitals with lower RN/bed ratio Hospitals with higher RN/bed ratio Indirect patients, RN/patient ratio 1.38 Directed patients, RN/patient ratio 1.4	Relative risk (95% CI) 1 1 1 0.95 0.93 0.96 Death rate 4.53 3.41
Hoover, 2000[23] The Health Care Financing Agency, HealthCareReportCards.com; MEDPAR database Mortality index = [(P -A) / P] * 100 where P = predicted mortality for each hospital according to patients characteristics, and A = actual mortality; In hospital mortality, and 6 months after submission mortality	The AHA and HCFA databases RN/LPN ratio = total number RN FTE/LPN FTE reported by the hospital and RN/total nursing staff	Hospitals Units 176 Medical	 Lowest quartile of RN proportion Highest quartile of RN proportion	Relative risk 1 1 1 0.84 0.78 0.92
Aiken, 2001[27] MedPar Mortality Data file for 1997 In hospital mortality	American Hospital Association Annual survey RN FTE/daily average units census	22 hospitals	Nurse staffing – RN FTE/average daily census in units	Correlation with mortality -0.49

Table G3. Evidence of the association between nurse staffing and mortality (continued)

Author, Source to Measure Mortality, Definition of Mortality	Source to Measure Nurse Staffing, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Mortality
Bond, 1999[60] Hospital Medicare mortality rates from the Health Care Financing Administration In hospital mortality/1,000 admissions and number of deaths/hospital/year	Data from the AHA and HCFA data bases were matched for 3,763 hospitals FTE RN/the mean number of occupied beds for each hospital FTE LPN/the mean number of occupied beds for each hospital	3,763 hospitals	Increase by 1 RN/patient Increase by 1 LPN/patient	Change in Death rate ± SD -0.0003 ± 0.0061 0.0005 ± 0.0092
Shortell, 1994[94] Hospitals discharge data In hospital mortality, standardized morality ratio (actual mortality in each unit/predicted mortality)	Hospital administrative databases; survey of nursing directors in each unit An average RN/patient ratio in unit during the study period, number of nurses who left ICU in the year of the study/number of nurses employed that year	40 hospitals, 42 ICU units; Patients Medical	Increase by 1 RN/patient ratio	Relative risk 1.14
Boyle, 2004[47] Patient discharges In-hospital mortality	Nurses NWI-R survey (N=390) of nurses working >1 month in the unit NWI-R 57 items questionnaire to report nurse autonomy and collaboration; NWI-R 57 items questionnaire to report nurse manager support	Single hospitals study, 21 units	Nurse manager support	Correlation with mortality -0.3
Halm, 2005[51] The hospital's data warehouse with patients discharges Mortality within 30 days of hospital admission	Survey of 140 staff nurses (42% response rate); daily variable staffing plans and unit census records Average RN/patient ratio was calculated for each nursing unit across all 3 shifts for every week; % of RN with BSN and	Single hospital study, age 55.6 years, 37.4% Males 22.7% emergency admission Patients Surgical	Increase by 1 unit in RN/patient ratio	Relative risk 1.01

Table G3. Evidence of the association between nurse staffing and mortality (continued)

Author, Source to Measure Mortality, Definition of Mortality	Source to Measure Nurse Staffing, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Mortality
	higher; years of total nursing experience; Burnout: Maslach Burnout Inventory Manual (max 6 scores) with 3 subscales of burnout: emotional exhaustion; depersonalization; personal accomplishment (feelings of competence and successful achievement in one's work). Overall rating on a simple 4-point Likert scale, ranging from 1 (very dissatisfied) to 4 (very satisfied) and the likelihood to leave current position within the next 12 months			
Thorson, 1995[55] Administrative data on patient discharges from the North Carolina Medical Database Commission In-hospital mortality	The archives of the NC Board of Nursing for 100 hospitals, an average of total nursing hours/patient day in surgical and medical units, an average RN hours/patient day in surgical and medical units	100 hospitals	Increase by 1 RN hour, crude odds of death Increase by 1 RN hour, adjusted for patient characteristics odds ratio Increase by 1 RN hour, adjusted for patient and hospital characteristics odds ratio	Relative risk (95% CI) 1.004 1.003 1.004 1.009 1.008 1.010 1.008 1.007 1.010
Unruh, 2000[66] State Health Care Cost Containment Council In-hospital mortality	State Department of Health, American Hospital Association Total nurses FTE/1,000 APDC RN FTE/1,000 APDC LPN FTE/1,000 APDC UAP FTE/1,000 APDC % of RN FTE /total nurses FTE	1,477 hospitals, Whites: 45.4% Males: 42.43%	Year RN/patient ratio % RN 1991 2.9 69 1992 2.7 69 1993 2.7 70 1994 2.7 71 1995 2.6 72 1996 2.8 71 1997 2.7 72 Increase by 1 unit in RN/patient ratio Increase by 1 unit in RN/patient ratio in small hospitals	Death rate 3.10 2.85 2.81 2.67 2.60 2.47 2.33 Change in death rate 0.02 0.32

Table G3. Evidence of the association between nurse staffing and mortality (continued)

Author, Source to Measure Mortality, Definition of Mortality	Source to Measure Nurse Staffing, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Mortality
			Increase by 1 unit in RN/patient ratio in medium hospitals	-0.13
			Increase by 1 unit in RN/patient ratio in large hospitals	-0.03
			Increase by 1 unit in LPN/patient ratio	-0.09
			Increase by 1 unit in LPN/patient ratio in small hospitals	-0.21
			Increase by 1 unit in LPN/patient ratio in medium hospitals	-0.31
			Increase by 1 unit in LPN/patient ratio in large hospitals	-0.19
			Increase by 1 unit in UAP/patient ratio	0.04
			Increase by 1 unit in UAP/patient ratio in small hospitals	0.38
			Increase by 1 unit in UAP/patient ratio in medium hospitals	-0.07
			Increase by 1 unit in UAP/patient ratio in large hospitals	0.005
			Increase by 1% in RN proportion	0.00
			Increase by 1% in RN proportion in small hospitals	-0.00
			Increase by 1% in RN proportion in medium hospitals	0.00
			Increase by 1% in RN proportion in large hospitals	0.00

AHA = American Hospital Association; AMI = Acute Myocardial Infarction; BSN = Bachelor or Science in Nursing; CI = Confidence Interval; CMS = Centers for Medicare and Medicaid Services; FTE = Full Time Equivalent; HMO = Health Maintenance Organization; ICU = Intensive Care Unit; LPN = Licensed Practical Nurse; LVN = Licensed Vocational Nurse; MedPAR = Medicare Provider Analysis Review; NIW = nursing intensity weights; RN = Registered Nurse; SD = Standard Deviation; UAP = Unlicensed Assistive Personnel

Table G4. The relative risk of hospital related mortality among estimated categories of patients/nurse/shift ratio

Author (Patients/RN/Shift)	RR	95% CI
Pronovost[61] (2 vs. 3)	0.53	0.33; 0.83
Amaravadi[64] (1.5 vs. 3)	0.70	0.30; 2.00
Dimick[70] (1.5 vs. 3.5)	2.04	0.78; 5.56
Aiken[5] (1.5 vs. 5)	0.19	0.06; 0.61
Aiken[5] (1.9 vs. 5)	0.08	0.01; 0.47
Aiken[5] (2 vs. 3)	0.94	0.91; 0.99
Aiken[39] (1 vs. 6)	0.67	0.51; 0.84
Aiken[39] (1 vs. 4)	0.76	0.64; 0.89
Person[88] (1.1 vs. 2.8)	0.91	0.86; 0.97
Person[88] (1.6 vs. 2.8)	0.94	0.88; 1.00
Person[88] (1.9 vs. 2.8)	0.96	0.90; 1.00
Elting[92](4.3 vs. 9.5)	0.43	0.19; 0.97
Mark[90] (4.2 vs. 13.3)	0.99	0.97; 1.02
Mark[90] (4.1 vs. 13.3)	1.03	1.00; 1.05
Mark[90] (3.8 vs. 13.3)	0.99	0.97; 1.01
Mark[90] (3.6 vs. 13.3)	1.01	0.99; 1.04
Mark[90] (6.7 vs. 13.3)	0.82	0.74; 0.91
Mark[90] (6.7 vs. 13.3)	1.01	0.74; 1.39
Mark[90] (5 vs. 13.3)	0.97	0.96; 0.99
Mark[90] (4 vs. 13.3)	0.99	0.98; 1.00
Mark[90] (3.3 vs. 13.3)	1.00	0.99; 1.02
Mark[90] (5 vs. 13.3)	0.97	0.93; 1.01
Mark[90] (4 vs. 13.3)	0.97	0.93; 1.01
Mark[90] (3.3 vs. 13.3)	0.97	0.91; 1.03
Mark[89] (4 vs. 13.3)	1.05	1.02; 1.08
Mark[89] (3.8 vs. 13.3)	0.97	0.94; 1.00
Mark[89] (4.2 vs. 13.3)	1.09	1.06; 1.12
Mark[89] (4.2 vs. 13.3)	1.15	1.12; 1.18
Mark[89] (4.4 vs. 13.3)	1.20	1.17; 1.23
Mark[89] (3.3 vs. 13.3)	0.96	0.95; 0.98
Mark[89] (4 vs. 13.3)	0.97	0.96; 0.98
Mark[89] (5 vs. 13.3)	0.98	0.97; 0.99
Mark[89] (3.7 vs. 13.3)	0.90	0.87; 0.93
Mark[89] (6.7 vs. 13.3)	0.84	0.76; 0.93
Silber[67] (1.6 vs. 2.7)	0.95	0.93; 0.96
Shortell[54] (1.5 vs. 3)	1.13	0.86; 1.13
Robertson[62] (1.5 vs. 3)	0.97	NR
Robertson[62] (1.5 vs. 3)	0.98	NR
Robertson[62] (1.5 vs. 3)	0.96	NR
Halm[51] (0.8 vs. 4)	1.02	NR
Author (Patients/LPN/Shift)		
Person[88] (8 vs.11)	1.07	1.00; 1.15
Person[88] (10 vs. 11)	1.00	0.94; 1.07
Mark[90] (18 vs. 13)	0.99	0.97; 1.02
Mark[90] (21 vs. 13)	1.03	1.00; 1.05
Mark[90] (24 vs. 13)	0.99	0.96; 1.01
Mark[90] (25 vs. 13)	1.01	0.99; 1.04
Mark[90] (7 vs. 13)	1.05	0.82; 1.34
Mark[90] (7 vs. 13)	0.68	0.30; 1.52
Robertson[62] (3 vs. 20)	0.92	NR
Mark[89] (21 vs. 13)	1.05	1.02; 1.08
Mark[89] (23 vs. 13)	0.97	0.94; 1.00
Mark[89] (20 vs. 13)	1.09	1.06; 1.12
Mark[89] (19 vs. 13)	1.15	1.12; 1.18
Mark[89] (20 vs. 13)	1.20	1.17; 1.23
Mark[89] (23 vs. 13)	0.90	0.87; 0.93
Mark[89] (7 vs. 13)	1.01	0.97; 1.06

NR– not reported

Table G5. Evidence of the association between nurse/patient ratio and patient outcomes

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse/Patient Ratios	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Aiken[39] Discharge abstracts, Failure to rescue: deaths within 30 days of admission among patients who experienced complications; Complications: the secondary diagnosis distinguished from preexisting comorbidities Surveys of hospital nurses (the Pennsylvania Board of Nursing) The mean number of patients assigned to all staff nurses who reported caring for at least 1 but fewer than 20 patients on the last shift they worked	168 ICU Surgical Age 60.8 61.3 Sex 42.9 41.8 Severity 28.5 18.9	60% of hospital workforce with BSN or higher, 8 patients/day 40% of hospital workforce with BSN or higher, 4 patients/nurse 20% of hospital workforce with BSN or higher, 4 patients/nurse 60% of hospital workforce with BSN or higher, 6 patients/nurse 40% of hospital workforce with BSN or higher, 6 patients/nurse 20% of hospital workforce with BSN or higher, 6 patients/nurse 60% of hospital workforce with BSN or higher, 4 patients/nurse 20-29% of hospital workforce with BSN or higher <20% of hospital workforce with BSN or higher 20% of hospital workforce with BSN or higher, 8 patients/nurse >50% of hospital workforce with BSN or higher 40-49% of hospital workforce with BSN or higher 30-39% of hospital workforce with BSN or higher 40% of hospital workforce with BSN or higher Increase in workload of 1 patient Reference 1 RN/patient 20-29% of hospital workforce with BSN or higher <20% of hospital workforce with BSN or higher >50% of hospital workforce with BSN or higher 40-49% of hospital workforce with BSN or higher 30-39% of hospital workforce with BSN or higher	Failure to rescue % 8.47 7.84 8.54 7.80 8.50 9.26 7.18 9.40 10.20 10.02 6.90 8.60 8.00 9.22 Relative Risk 1.05 1.01 1.10 1 Complications, % 22.90 22.90 25.20 22.00 22.80

Table G5. Evidence of the association between nurse/patient ratio and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse/Patient Ratios	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Aiken[74] Hospital data (Health Care Cost Containment Council; Failure to rescue: deaths within 30 days of admission among patients who experienced complications; Survey of 50% random sample of registered nurses who were on the Pennsylvania Board of Nursing rolls; The mean patient load across all staff registered nurses who reported having responsibility for at least 1 but fewer than 20 patients on the last shift they worked, regardless of the specialty or shift (day, evening, night) worked	168 Combined Surgical Age 59.3 Sex 43.7 Severity 27.3	Increase by 6 patients/nurse Increase by 1 patient/nurse Increase by 8 patients/nurse Increase by 4 patients/nurse Reference 1 RN/patient	Failure to rescue, Relative risk 1.50 1.13 1.87 1.07 1.02 1.11 1.72 1.17 2.30 1.31 1.08 1.52 1.00 1.00 1.00
Alonso-Echanove[79] All adult patients admitted to the ICU for at least 48 hours; Bloodstream infections as secondary diagnosis after CVC. Duration of CVC-number of days from the placement date to the day when bloodstream infection occurred or to the day of CVC removal; Unit administrative records; Number of RN nurses for each patient each day; Number of patient care assistants/100 patients	ICU Medical Race 61 Sex 54	All ICU from 1997-1999 RN/patient ratio: 0.5 Patient/UAP: 14.3 Increase by 1 RN and UAP/patient	Bloodstream infections, rate % 2.80 Relative risk Not significant

Table G5. Evidence of the association between nurse/patient ratio and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse/Patient Ratios	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes		
Amaravadi[64]	ICU		Pneumonia %		
The Uniform Health	Surgical	Night time nurse to patient ratio <1:2	16.00		
Discharge Data Set;	Age 63	Night time nurse to patient ratio >1:2	8.00		
Postoperative pneumonia;	Race 77		Relative risk		
aspiration, pulmonary failure;	Sex 70	Night time nurse to patient ratio <1:2	2.40	1.20	4.70
reintubation after unplanned	Severity 12	Night time nurse to patient ratio >1:2	1.00	1.00	1.00
extubation; cardiac arrest;			Pulmonary failure %		
Complications: respiratory,		Night time nurse to patient ratio <1:2	25.00		
Pneumonia, reintubation,		Night time nurse to patient ratio >1:2	22.00		
aspiration, infectious,			Relative risk		
septicemia, postoperative		Night time nurse to patient ratio <1:2	1.20	0.70	2.00
infection, myocardial		Night time nurse to patient ratio >1:2	1.00	1.00	1.00
infarction, cardiac arrest,			Reintubation %		
surgical complications, acute		Night time nurse to patient ratio <1:2	25.00		
renal failure, septicemia;		Night time nurse to patient ratio >1:2	12.00		
Survey of ICU directors;			Relative risk		
An average nurse-to-patient		Night time nurse to patient ratio <1:2	2.50	1.40	4.50
ratio of greater than or equal		Night time nurse to patient ratio >1:2	1.00	1.00	1.00
to 1:2 versus less than 1:2			CPR %		
both during the day and at		Night time nurse to patient ratio <1:2	0.80		
night		Night time nurse to patient ratio >1:2	0.00		
			Relative risk		
		Night time nurse to patient ratio <1:2	1.20	0.60	2.20
		Night time nurse to patient ratio >1:2	1.00	1.00	1.00
			Medical complications %		
		Night time nurse to patient ratio <1:2	0.80		
		Night time nurse to patient ratio >1:2	0.90		
			Relative risk		
		Night time nurse to patient ratio <1:2	0.90	0.08	9.70
		Night time nurse to patient ratio >1:2	1.00	1.00	1.00
			Surgical complications %		
		Night time nurse to patient ratio <1:2	17.00		
		Night time nurse to patient ratio >1:2	8.00		
			Relative risk		
		Night time nurse to patient ratio <1:2	1.90	0.90	3.80
		Night time nurse to patient ratio >1:2	2.10	0.70	6.40

Table G5. Evidence of the association between nurse/patient ratio and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse/Patient Ratios	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
		Night time nurse to patient ratio <1:2 Night time nurse to patient ratio >1:2 Night time nurse to patient ratio <1:2 Night time nurse to patient ratio>1:2	Sepsis, % 6.20 1.80 Relative risk 3.70 1.10 12.50 1.00 1.00 1.00
Bolton[26] California Nursing Outcomes Coalition database; the California Department of Health Services; 1,253,892 inpatient days; Hospital acquired pressure ulcers: the monthly rate per 1,000 patient days for each nursing unit and each hospital. Falls: unplanned descent to the floor in adult patients; the monthly fall rate per 1,000 patient days for each nursing unit and each hospital. Data were collected at the patient level and aggregated by CalNOC staff to the unit level. California Nursing Outcomes Coalition database; the California Department of Health Services RN/patient day	Unit Patients Medical Medical ICU Medical	Medical-surgical units: 5 patients/RN, 2.4 patient/UAP Critical Care units: 1.6 patients/RN Medical-surgical units: 5 patients/RN, 2.4 patient/UAP Critical Care units: 1.6 patients/RN	Falls /100 patient days 3.70 0.10 Pressure ulcers/100 patient days 8.00 13.00

Table G5. Evidence of the association between nurse/patient ratio and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse/Patient Ratios	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Cheung[32] Incidence reports, quality referrals, and medical record coding stores in the database Excalibur system Pressure ulcers coded as secondary diagnosis; patients falls coded as secondary diagnosis; primary bloodstream infections after admitting the unit; Automated Nurse staffing Office system and direct observation of nursing activities with Hill_Rom COMposer@nurse locator system; Number of patients assigned to RN during a shift; number of patients assigned to LPN during the shift; ratio of RN and LPN to unlicensed nursing personnel	Unit Combined Patients Medical	Increase by one increment in nurse staffing variables: RN/patient ratio LPN/patient ratio Increase by one increment in nurse staffing variables: RN/patient ratio LPN/patient ratio Increase by one increment in nurse staffing variables: RN/patient ratio LNPNpatient ratio	Pressure ulcers Relative risk NS NS Falls, Relative risk NS NS Primary bloodstream infection Relative risk NS NS

Table G5. Evidence of the association between nurse/patient ratio and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse/Patient Ratios	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Dang[75] The Uniform Health Discharge Data Set Aspiration, atelectasis or pulmonary failure; pneumonia; pulmonary insufficiency after a procedure; tracheal reintubation; cardiac arrest; Cardiac complications: acute myocardial infarction Cardiac complications after a procedure Other: acute renal failure, platelet transfusion Any other complication Any complication; septicemia; Survey of ICU directors; An average nurse-to-patient ratio in the ICU during the daytime; low-intensity staffing (1:3 or greater on the day and night shifts); medium intensity (1:3 or greater on either the day or night shift, but not both);high-intensity staffing <1:2	Unit ICU Patients Surgical Race 89 Sex 68 Severity 13	High Intensity 4 patients/RN Mixed Intensity 3 patients/RN Low Intensity 2 patients/RN High Intensity 4 patients/RN Mixed Intensity 3 patients/RN Low Intensity 2 patients/RN High Intensity 4 patients/RN Mixed Intensity 3 patients/RN Low Intensity 2 patients/RN High Intensity 4 patients/RN Mixed Intensity 3 patients/RN Low Intensity 2 patients/RN High Intensity 4 patients/RN Low Intensity 2 patients/RN	Relative risk Pulmonary failure 2.33 1.50 3.60 5.11 2.89 9.04 1.00 1.00 1.00 Extubation 2.33 1.50 3.60 2.09 1.47 3.03 1.00 1.00 1.00 CPR 1.34 0.82 2.17 2.10 1.26 3.50 1.00 1.00 1.00 Complication 1.34 0.82 2.17 2.10 1.26 3.50 1.00 1.00 1.00 Sepsis 1.13 0.73 1.75 1.00 1.00 1.00
Dimick[70] The Uniform Health Discharge Data Set Postoperative pneumonia, pulmonary failure, aspiration, reintubation, cardiac arrest, myocardial infarction, acute renal failure; septicemia; Survey of ICU directors; An average nurse-to-patient	Unit: ICU Patients: Surgical Group 316 Age 56 Race 82 Severity 15	More nurses: RN/patient 1:1-1:2 Fewer nurses: RN/patient 1:3-1:4 More nurses: RN/patient 1:1-1:2 Fewer nurses: RN/patient 1:3-1:4 More nurses: RN/patient 1:1-1:2 Fewer nurses: RN/patient 1:3-1:4	Pneumonia, % 2.80 4.20 Relative risk 1.00 1.00 1.00 1.40 0.60 3.50 Pulmonary Failure % 1.60 5.80 Relative risk

Table G5. Evidence of the association between nurse/patient ratio and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse/Patient Ratios	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
ratio in the ICU during the day and evening and at night; "more ICU nurses: nurse/ patient ratio 1:1 or 1:2; "fewer ICU nurses": nurse/patient ratio 1:3 or 1:4		More nurses: RN/patient 1:1-1:2 Fewer nurses: RN/patient 1:3-1:4 More nurses: RN/patient 1:1-1:2 Fewer nurses: RN/patient 1:3-1:4 More nurses: RN/patient 1:1-1:2 Fewer nurses: RN/patient 1:3-1:4 More nurses: RN/patient 1:1-1:2 Fewer nurses: RN/patient 1:3-1:4 More nurses: RN/patient 1:1-1:2 Fewer nurses: RN/patient 1:3-1:4 More nurses: RN/patient 1:1-1:2 Fewer nurses: RN/patient 1:3-1:4	1.00 1.00 1.00 3.60 1.30 10.10 Extubation % 1.90 10.80 Relative risk 5.70 2.40 13.70 CPR % 0.60 0.80 Complications % 6.60 1.20 Sepsis % 2.70 5.40
Donaldson[9] CalNOC database Total number of patients with Stage I-IV pressure ulcers regardless of whether ulcer was acquired during hospitalization or present on admission; %/total number of surveyed patients, unplanned descent to the floor; rate/1,000 patient days. CalNOC database in 2004 and 2005 (after legislation); number of patients/RN	Hospitals 68 Unit Combined Patients Medical	Medical surgical units, before mandatory ratios: 5.43 patients/RN Medical and surgical units after mandatory ratios: 4.48 patients/RN Step-down units before mandatory ratios: 4.02 patients/RN Step-down units after mandatory ratios: 3.56 patients/RN Medical surgical units, before mandatory ratios: 5.43 patients/RN Medical and surgical units after mandatory ratios: 4.48 patients/RN Step-down units before mandatory ratios: 4.02 patients/RN Step-down units after mandatory ratios: 3.56 patients/RN	Falls /100 patient days ± SD 0.31 ± 0.20 0.32 ± 0.17 0.30 ± 0.22 0.26 ± 0.16 Pressure ulcers/100 patient days ± SD 14.07 ± 11.07 14.48 ± 10.39 13.52 ± 10.78 16.29 ± 10.27

Table G5. Evidence of the association between nurse/patient ratio and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse/Patient Ratios	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Donaldson[95] California Nursing Outcomes Coalition (CalNOC) Hospital acquired pressure related skin injury controlling for date of admission, % of all patients on the day of prevalence study; patient's unplanned descent to the hospital floor; were analyzed as 7 day aggregate per unit; also actually number per unit; the number of falls/1000 patient days. The California Nursing Outcomes Coalition (CalNOC)	Hospitals 25 Unit Combined Patient Medical	Increase by 1 patient/RN Increase by 1 patient/licensed staff	Change in falls rate/100 patient days ± SD 0.02 ± 0.05 0.02 ± 0.09
Elting[92] The Texas Hospital Discharge Public Use Data File linked to the 2000 U.S. Census Bacteremia, wound infection, pulmonary compromise, pneumonia, deep venous thrombosis, pulmonary embolus, reoperation, postoperative coma or shock, acute myocardial infarction, arrhythmia, and cardiac arrest or shock. Hospital Cost Report Information System, Provider of Services files, and the American Hospital Association Survey; number of LPN/mean annual number	Hospitals 75 Unit Surgical Patients Surgical	Hospitals with many RNs/occupied bed 3.1 RNs/patient Hospitals with few RNs/occupied bed 1.4 RNs/patient Hospitals with many RNs/occupied bed 3.1 RNs/patient Hospitals with few RNs/occupied bed 1.4 RNs/patient Hospitals with many LPNs/occupied bed 0.32 patients/LPN Hospitals with few LPNs/occupied bed 1.40 patients/LPN	Failure to rescue Relative risk 1.00 1.00 1.00 0.39 0.10 0.80 Complication rate % 12.60 16.20 14.20 14.00

Table G5. Evidence of the association between nurse/patient ratio and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse/Patient Ratios	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
of occupied bed days, number of RN/mean annual number of occupied bed days			
Flood[53] Patient medical records; nosocomial infections including urinary tract infections and gangrene; congestive heart failure and arrhythmias, gastrointestinal bleeding. Staffing workload index; RN FTE/patient/shift/unit	Hospitals 1 Unit Combined Patients Medical	Understaffed unit 3.8 patient/s RN Normally staffed unit 4.94 patients/RN Understaffed unit 3.8 patients/RN Normally staffed unit 4.94 patients/RN Understaffed unit 3.8 patients/RN Normally staffed unit 4.94 patients/RN	Urinary tract infection % 0.12 0.14 Nosocomial infection % 0.16 0.19 Complication % 64.00 71.00
Fridkin[1] Medical records of surgical patient in ICU. Cases were defined as any patient hospitalized >48 hours, in the SICU >24 hours who developed a laboratory confirmed CVC-BSI during outbreak periods. Controls were randomly selected from all SICU patients; laboratory confirmed catheter-associated bloodstream infections or clinical sepsis; rates were compared in pre- and outbreak periods. Hospital administrative records; average monthly SICU patient-to-nurse ratio; ratio in pre- and outbreak periods	Hospitals 1 Unit ICU Patients Surgical	Month's patient/nurse ratio = 1.2 Month's patient/nurse ratio = 1.5 Month's patient/nurse ratio = 2 Month's patient/nurse ratio = 1 Pre-outbreak period Outbreak period Pre-outbreak period Outbreak period	Nosocomial infection Relative risk 3.95 1.07 14.54 15.60 1.15 211.40 61.50 1.23 3,074 1.00 1.00 1.00 Rate/100 patient days 1.95 4.96 Sepsis, rate/100 patient days 0.53 1.31

Table G5. Evidence of the association between nurse/patient ratio and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse/Patient Ratios	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories		Patient Outcomes
Halm[51] The hospital's data warehouse with patient's discharges; failure to rescue: death following complications within 30 days. Survey of 140 staff nurses (42% response rate); daily variable staffing plans and unit census records Average RN/patient ratio was calculated for each nursing unit across all 3 shifts for every week	Hospitals 1 Unit Surgical Patients Surgical	Increase by 1 unit in RN/patient ratio		Failure to rescue Relative risk NS
Hope[86] Medical Microbiology Laboratory and Infection Control Services; Discharge Abstract Database incidence rate of urinary tract infection, incidence rate of ventilator associated pneumonia, incidence rate of infections that occurred after 72 hours of hospitalization, incidence rate of surgical site infections, incidence rate of positive culture with known pathogen or two or more positive cultures with pathogens one can be considered as contaminant. The Grace Reynolds Application of the Study of Peto; Nursing Workload Office Calculated from RN utilization	Unit Patients Surgical Surgical Surgical Surgical Surgical Surgical Surgical Surgical Medical Medical Medical Medical Medical Medical Medical Medical Medical Medical Medical Medical Medical Medical Specialty Medical ICU Medical ICU Medical Surgical Medical Neonatal Medical		Patients/RN Surgery ward 1 5.64 Surgery ward 2 6.97 Surgery ward 3 5.16 Surgery ward 4 6.64 Medicine ward 1 6.79 Medicine ward 2 4.07 Medicine ward 3 6.11 Medicine ward 4 6.09 medicine ward 4 6.19 Medicine ward 5 6 Medicine ward 6 5.39 Medicine ward 7 5.54 Coronary Care Unit 4.62 ICU unit 2.45 Neonatal ICU 2.14 Neurosurgical critical care unit 6.79 Pediatrics unit 4.39 Surgery ward 1 5.64 Surgery ward 2 6.97	Rate/100 patient days Urinary tract infection, 0.65 0.88 0.91 0.66 0.00 0.65 0.50 0.64 1.27 0.68 0.72 0.74 0.42 1.13 4.03 1.33 0.27 Relative risk NS Nosocomial infection 0.01 0.06

Table G5. Evidence of the association between nurse/patient ratio and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse/Patient Ratios	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories		Patient Outcomes
as (national US standard * Utilization) / 100		Surgery ward 3	5.16	0.02
		Surgery ward 4	6.64	0.03
		Medicine ward 1	6.79	0.03
		Medicine ward 2	4.07	0.02
		Medicine ward 3	6.11	0.01
		Medicine ward 4	6.09	0.01
		Medicine ward 4	6.19	0.001
		Medicine ward 5	6	0.001
		Medicine ward 6	5.39	0.01
		Medicine ward 7	5.54	0.04
		Coronary Care Unit	4.62	0.001
		ICU unit	2.45	0.20
		Neonatal ICU	2.14	0.01
		Neurosurgical critical care unit	6.79	0.01
		Pediatrics unit	4.39	0.001
				Relative Risk NS
		Surgery ward 1	5.64	Sepsis, %
		Surgery ward 2	6.97	7.54
		Surgery ward 3	5.16	11.80
		Surgery ward 4	6.64	0.33
		Medicine ward 1	6.79	4.59
		Medicine ward 2	4.07	0.00
		Medicine ward 3	6.11	7.21
		Medicine ward 4	6.09	2.95
		medicine ward 4	6.19	1.31
		Medicine ward 5	6	
		Medicine ward 6	5.39	7.87
		Medicine ward 7	5.54	8.20
		Coronary Care Unit	4.62	6.56
		ICU unit	2.45	1.97
		Neonatal ICU	2.14	23.28
		Neurosurgical critical care unit	6.79	9.51
		Pediatrics unit	4.39	4.59
				2.30
			Patients/RN	UTI relative risk
		Higher RN Utilization (111%)	5.34	1.14 1.02 1.26

Table G5. Evidence of the association between nurse/patient ratio and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse/Patient Ratios	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
			Pneumonia relative risk
		1% increase in RN utilization 5.94	0.97 0.94 1.01
		Higher RN Utilization (111%), 5.34	0.66 0.43 1.01
		Higher RN utilization (>89%) 7.14	1.59 2.43 1.04
			Nosocomial infection relative risk
		1% increase in RN utilization 5.94	0.97 0.96 0.99
		Higher RN Utilization (111%) 5.34	0.62 0.31 1.23
		1% increase in RN utilization 5.94	1.01 0.99 1.03
			Sepsis relative risk
		1% increase in RN utilization, surgery wards 5.94	0.98 0.97 0.98
		Higher RN Utilization (111%), surgery wards 5.34	0.66 0.50 0.87
		1% increase in RN utilization, surgery wards 5.94	0.99 0.98 1.00
		Higher RN utilization (>114%) in surgical units 5.16	0.53 0.34 0.83
Houser[49] Nationwide Inpatient Sample of 2001 with hospital discharge records; Failure to rescue: death/1,000 patients who developed complications of care during hospitalization; cases of decubitus ulcer/1,000 discharges identified as secondary diagnosis, cases of acute respiratory failure/1,000 surgical discharges, cases of deep vein thrombosis or PE/1,000 surgical discharges. American Hospital Association Annual Survey for 2001; Hospital reported RN FTE/average daily census	Hospitals 170 Unit Combined Patients Medical Age 55.08 Race 51 Sex 42		Failure to rescue % ± SD
		RN/patient ratio 0.15-1.29	11.61 ± 8.41
		RN/patient ratio 1.3-1.89	13.82 ± 5.80
		RN/patient ratio 1.9-2.49	12.40 ± 9.11
		RN/patient ratio 2.5-6.5	10.51 ± 6.82
		RN/patient ratio 3.5-4.41	9.01 ± 6.26
		RN/patient ratio 4.57-5.5	9.42 ± 10.16
		RN/patient ratio 5.67-7.67	5.43 ± 8.89
			Relative risk
		Increase by 1 unit in nurse staffing levels	0.92 0.88 0.96
		Reference (RN/patient=1)	1.00
			Decubitus ulcers % ± SD
		RN/patient ratio 0.15-1.29	2.21 ± 1.78
		RN/patient ratio 1.3-1.89	2.57 ± 1.62
		RN/patient ratio 1.9-2.49	2.14 ± 1.45
		RN/patient ratio 2.5-6.5	1.90 ± 1.70
		RN/patient ratio 3.5-4.41	1.70 ± 1.39
		RN/patient ratio 4.57-5.5	1.44 ± 1.48
		RN/patient ratio 5.67-7.67	2.24 ± 4.21
			Pulmonary failure % ± SD
		RN/patient ratio 0.15-1.29	0.26 ± 0.65
		RN/patient ratio 1.3-1.89	0.33 ± 0.37
		RN/patient ratio 1.9-2.49	0.32 ± 0.37

Table G5. Evidence of the association between nurse/patient ratio and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse/Patient Ratios	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
		RN/patient ratio 2.5-6.5 RN/patient ratio 3.5-4.41 RN/patient ratio 4.57-5.5 RN/patient ratio 5.67-7.67 Increase by 1 unit in nurse staffing levels Reference (RN/patient = 1) RN/patient ratio 0.15-1.29 RN/patient ratio 1.3-1.89 RN/patient ratio 1.9-2.49 RN/patient ratio 2.5-6.5 RN/patient ratio 3.5-4.41 RN/patient ratio 4.57-5.5 RN/patient ratio 5.67-7.67 Increase by 1 unit in nurse staffing levels Reference (RN/patient = 1)	0.19 ± 0.42 0.15 ± 0.36 0.34 ± 0.79 0.00 Relative risk 0.94 0.77 1.15 1.00 1.00 1.00 Thrombosis % ± SD 0.52 ± 0.71 0.75 ± 0.63 0.68 ± 0.65 0.44 ± 0.78 0.38 ± 1.06 0.52 ± 1.28 0.06 ± 0.13 0.84 0.75 0.93 1.00 1.00 1.00
Kovner[35] The National Inpatient Sample (NIS) Post operative discharges with UTI, pneumonia, pulmonary congestion, lung edema, or respiratory failure, and DVT in any secondary diagnosis. American Hospital Association Annual Survey of Hospitals, the part of the Health Care Utilization Project	Hospitals 5,708 Unit Surgical Patient Surgical	Increase by 1 patient/LPN Increase by 1 patient/LPN Increase by 1 patient/LPN Increase by 1 patient/LPN	Urinary tract infection relative risk 1.01 Pneumonia, relative risk 0.99 Pulmonary failure, relative risk 1 Thrombosis, relative risk 0.96

Table G5. Evidence of the association between nurse/patient ratio and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse/Patient Ratios	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories			Patient Outcomes		
Marcin[3] ICU Evaluation Database (controls), incidence reports (cases) Extubation where the endotracheal tube was displaced or removed from the trachea by either the patient (self-extubation) or unplanned by medical personnel (e.g., when positioning a patient for a radiograph or procedure). Archived nursing assignments, self-reported years in ICU; nurse-to-patient ratio at the time of the unplanned extubation or matching time for the control patients. Standard ratio 1:1 or 1:2	Hospitals 1 Size 220 Unit ICU Patients Combined Age 3 years	1:2 nurse/patient ratio 1:1 nurse/patient ratio			Extubation relative risk 4.24 1.00 19.10 1.00 1.00 1.00		
Mark[89] The Healthcare Cost and Utilization Project (HCUP) National Inpatient Sample (NIS) Risk-adjusted observed/ expected urinary tract infections, risk-adjusted observed/expected pneumonias, risk-adjusted observed/expected decubitus ulcers American Hospital Association Annual Survey, Online Survey Certification and Reporting System	Hospitals 357 Unit Combined Patients Combined		RN/patient	Patients/LPN	Urinary tract infection relative risk		
		Year 1993	3.36	1.56	1.14	1.08	1.20
		Year 1994	3.5	1.69	1.11	1.05	1.17
		Year 1992	3.2	1.52	1.17	1.11	1.23
		Year 1992	3.14	1.45	1.17	.12	1.22
		Year 1990	3.02	1.47	1.18	1.13	1.23
		75th quartile of RN FTE/1,000 patient-days	4.02		0.93	0.90	0.95
		50th quartile of RN FTE/1,000 patient-days	3.34		0.94	0.91	0.96
		25th quartile of RN FTE/1,000 patient-days	2.66		0.95	0.92	0.97
		Year 1995	3.6	1.69	0.98	0.93	1.03
		Increase by 1 RN FTE/patient day	2		1.05	.92	1.21
		Reference 1 RN FTE/patient day	1		1.00		
					Pneumonia relative risk		
		Year 1993	3.36	1.56	0.84	0.79	0.89
		Year 1994	3.5	1.69	0.90	0.85	0.95
		Year 1992	3.2	1.52	0.72	0.67	0.77

Table G5. Evidence of the association between nurse/patient ratio and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse/Patient Ratios	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories			Patient Outcomes		
[OSCAR] RN FTEs/1,000 inpatient days		Year 1992	3.14	1.45	0.65	0.60	0.70
		Year 1990	3.02	1.47	0.61	0.56	0.66
		75th quartile of RN FTE/1,000patient-days	4.02		0.98	0.95	1.01
		50th quartile of RN FTE/1,000patient-days	3.34		0.96	0.93	0.99
		25th quartile of RN FTE/1,000patient-days	2.66		0.94	0.91	0.97
		Year 1995	3.6	1.69	0.97	0.91	1.03
		Increase by 1 RN FTE/patient day	2		1.03	0.92	1.16
		Reference 1 RN FTE/patient day	1		Reference 1		
					Decubitus ulcers relative risk		
		Year 1993	3.36	1.56	0.62	0.57	0.67
		Year 1994	3.5	1.69	0.69	0.63	0.75
		Year 1992	3.2	1.52	0.58	0.53	0.63
		Year 1992	3.14	1.45	0.51	0.46	0.56
		Year 1990	3.02	1.47	0.48	0.44	0.52
		75th quartile of RN FTE/1,000patient-days	4.02		0.96	0.93	0.99
		50th quartile of RN FTE/1,000patient-days	3.34		0.96	0.93	0.98
		25th quartile of RN FTE/1,000patient-days	2.66		0.95	0.92	0.98
		Year 1995	3.6	1.69	0.74	0.69	0.79
		Increase by 1 RN FTE/patient day	2		1.10	0.99	1.22
		Reference 1 RN FTE/patient day	1		1.00	1.00	1.00
Potter[40] Medical records (number of falls on a unit/number of patient days * 1,000 Administrative hospital data Proportion of UAP hours of direct patient care	Hospitals 1 Size 32 Unit ICU Patients Medical			Patients/UAP	Falls/100 patient days		
		Means in time period 2-4/2000		1.1501	0.30		
		Means in time period 5-7/2000		1.1078	0.29		
		Means in time period 8-10/2000		1.134	0.30		
		Means in time period 11-1/2001		1.1532	0.23		
Pronovost[72] The Uniform Health Discharge Data Set Acute lung edema, pulmonary insufficiency after surgery, respiratory failure not otherwise specified, reinsertion of endotracheal tube, cardio respiratory arrest Medical complications: acute	Unit ICU Patients Surgical Age 68 Race 89 Sex 66 Severity 11 Hospitals 7 31 7				Pulmonary failure %		
		Fewer nurses	RNs/patient 1:3 or 1:4		24.00		
		More nurses	RNs/patient 1:1 or 1:2		9.00		
		Fewer nurses	RNs/patient 1:3 or 1:4		24.00		
		More nurses	RNs/patient 1:1 or 1:2		9.00		
					Pulmonary failure relative risk		
		Fewer nurses	RNs/patient 1:3 or 1:4		2.60	2.10	3.20
		More nurses	RNs/patient 1:1 or 1:2		1.00	1.00	1.00
		Fewer nurses	RNs/patient 1:3 or 1:4		4.50	2.90	6.90
		More nurses	RNs/patient 1:1 or 1:2		1.00	1.00	1.00

Table G5. Evidence of the association between nurse/patient ratio and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse/Patient Ratios	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories		Patient Outcomes
renal failure, septicemia,	31			Extubation %
acute myocardial infarction,		Fewer nurses	RNs/patient 1:3 or 1:4	21
cardiac arrest		More nurses	RNs/patient 1:1 or 1:2	13
Surgical complications:		Fewer nurses	RNs/patient 1:3 or 1:4	21
surgical complications after a		More nurses	RNs/patient 1:1 or 1:2	13
procedure, surgical E codes,				Extubation relative risk
reoperation for bleeding,		Fewer nurses	RNs/patient 1:3 or 1:4	1.50 1.30 1.80
bloodstream infection,		More nurses	RNs/patient 1:1 or 1:2	1.00 1.00 1.00
hemorrhage or hematoma		Fewer nurses	RNs/patient 1:3 or 1:4	1.60 1.10 2.50
complicating surgery.		More nurses	RNs/patient 1:1 or 1:2	1.00 1.00 1.00
Survey to the ICU directors;				CPR %
An average ICU nurse-to-		Fewer nurses	RNs/patient 1:3 or 1:4	2
patient ratio during the day		More nurses	RN/patient 1:1 or 1:2	1
and evening		Fewer nurses	RNs/patient 1:3 or 1:4	2
		More nurses	RNs/patient 1:1 or 1:2	1
				CPR relative risk
		Fewer nurses	RNs/patient 1:3 or 1:4	1.40 0.60 3.00
		More nurses	RNs/patient 1:1 or 1:2	1.00 1.00 1.00
		Fewer nurses	RNs/patient 1:3 or 1:4	1.70 0.70 4.70
		More nurses	RNs/patient 1:1 or 1:2	1.00 1.00 1.00
				Surgical complications %
		Fewer nurses	RNs/patient 1:3 or 1:4	47
		More nurses	RNs/patient 1:1 or 1:2	34
		Fewer nurses	RNs/patient 1:3 or 1:4	47
		More nurses	RNs/patient 1:1 or 1:2	34
				Relative risk
		Fewer nurses	RNs/patient 1:3 or 1:4	1.40 1.20 1.50
		More nurses	RNs/patient 1:1 or 1:2	1.00 1.00 1.00
		Fewer nurses	RNs/patient 1:3 or 1:4	1.70 1.30 2.40
		More nurses	RNs/patient 1:1 or 1:2	1.00 1.00 1.00

Table G5. Evidence of the association between nurse/patient ratio and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse/Patient Ratios	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
			Medical complications %
		Fewer nurses RNs/patient 1:3 or 1:4	43
		More nurses RNs/patient 1:1 or 1:2	28
		Fewer nurses RNs/patient 1:3 or 1:4	43
		More nurses RNs/patient 1:1 or 1:2	28
			Relative risk
		Fewer nurses RNs/patient 1:3 or 1:4	1.50 1.40 1.70
		More nurses RNs/patient 1:1 or 1:2	1.00 1.00 1.00
		Fewer nurses RNs/patient 1:3 or 1:4	2.10 1.50 2.90
		More nurses RNs/patient 1:1 or 1:2	1.00 1.00 1.00
			Sepsis %
		Fewer nurses RNs/patient 1:3 or 1:4	4
		More nurses RNs/patient 1:1 or 1:2	3
		Fewer nurses RNs/patient 1:3 or 1:4	4
		More nurses RNs/patient 1:1 or 1:2	3
			Relative risk
		Fewer nurses RNs/patient 1:3 or 1:4	1.40 0.80 2.10
		More nurses RNs/patient 1:1 or 1:2	1.00 1.00 1.00
		Fewer nurses RNs/patient 1:3 or 1:4	1.90 0.90 3.90
		More nurses RNs/patient 1:1 or 1:2	1.00 1.00 1.00
			Bleeding %
		Fewer nurses RNs/patient 1:3 or 1:4	2
		More nurses RNs/patient 1:1 or 1:2	3
		Fewer nurses RNs/patient 1:3 or 1:4	2
		More nurses RNs/patient 1:1 or 1:2	3
			Relative risk
		Fewer nurses RNs/patient 1:3 or 1:4	0.80 0.40 1.60
		More nurses RNs/patient 1:1 or 1:2	1.00 1.00 1.00
		Fewer nurses RNs/patient 1:3 or 1:4	1.20 0.40 3.50
		More nurses RNs/patient 1:1 or 1:2	1.00 1.00 1.00

Table G5. Evidence of the association between nurse/patient ratio and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse/Patient Ratios	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Silber[67] Pennsylvania Medicare claims records; the Medicare Standard Analytic Files; random sample of 50% of Medicare patients who underwent general surgical or orthopedic procedures; Failure to rescue: 30-day death rate after complications, in-hospital complication rate: Cardiac event, CHF, Shock, DVT and PE, Stroke, TIA, Coma, Nosocomial infections, pneumonia, pulmonary failure, pressure ulcers, wound infections, sepsis, and bleeding. The American Hospital Association Annual Surveys for 1991–1993, and the Pennsylvania Health Care Cost Containment Council Data Base for years 1991–1994; RN/bed ratio at hospital level	Hospitals 245 Size 217,440 Unit Surgical Patients Surgical	Hospitals with lower RN/bed ratio 1.1 Hospitals with higher RN/bed ratio 1.87 Indirect patients 1.38 RNs/patient Directed patients 1.4 RNs/patient Hospitals with lower RN/bed ratio 1.1 Hospitals with higher RN/bed ratio 1.87 Indirect patients 1.38 RNs/patient Directed patients 1.4 RNs/patient	Failure to rescue relative risk 1.00 1.00 1.00 0.94 0.92 0.96 % 9.32 8.18 Complications relative risk 1.00 1.00 1.00 1.04 1.03 1.04 % 47.87 41.15

Table G5. Evidence of the association between nurse/patient ratio and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse/Patient Ratios	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories				Patient Outcomes	
Simmonds[82] Active microbiological surveillance of all chronic patients admitted for >30 days of hemodialysis; volunteering patient participation in other units, % of patients with positive colonization of vancomycin-resistant enterococci 48 hours after admission to the hospital and after surgery; Administrative reports of Patient Care Manager and Nursing Workload Specialist; Integrated Nursing System database, FTE RNs/number of beds	Hospitals 1 Unit Spec Patients Medical Age 68.75 Sex 55.8				Patient/RN	Nosocomial infection, %	
		Means at the beginning of the study			1.64	1.61	
		Means after 1 year			1.62	3.29	
		Means after 2 year			1.60	4.97	
		Means after 3 year			1.58	6.65	
		RN/patient ratio at the beginning of the study			1.64	1.92	
		RN/patient ratio after 1 year			1.62	1.75	
		RN/patient ratio after 2 years			1.60	1.58	
		RN/patient ratio after 3 years			1.58	1.41	
Stegenga[78] Patients and laboratory records Nosocomial viral gastrointestinal infections (NVGIs) (CDC definition). Rate = number of NVGIs/1,000 patient days. Administrative hospital records Number of nurses/patient in each shift according to actual work schedule. Ratio was calculated 72 hours before and after infection event	Hospitals 1 Unit ICU Patients Medical		RN/patient ratio			Nosocomial infection /100 patient days	
		Pre infection night shifts	3.16			1.3	
		Post infection night shifts	3.26			0	
Unruh[66] State Health Care Cost Containment Council Secondary diagnosis of	Hospitals 1,477 Unit Combined Patients Combined Race 45.37		RN/patient	Patients/LPN	Patients/ UAP	UTI %	Decubitus ulcer %
		State data in 1991	2.9	1.5	1.6	5.18	0.55
		State data in 1992	2.7	1.7	1.7	4.48	0.49
		State data in 1993	2.7	1.8	1.8	4.44	0.53

Table G5. Evidence of the association between nurse/patient ratio and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse/Patient Ratios	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
nosocomial UTI, hospital acquired pneumonia, decubitus ulcer, adult atelectasis, and cardiac arrest	Sex 42.43	State data in 1994 2.7 2.0 1.8 State data in 1995 2.6 2.0 1.8 State data in 1996 2.8 2.1 1.8 State data in 1997 2.7 2.4 1.7 Mean RN/patient levels in medium size hospitals: 2.67 Reduction by 10% in LPN/patient ratio, medium size hospitals: 2.4 Mean LPN/patient levels in medium size hospitals: 1.9 Reduction by 10% in LPN/patient ratio, medium size hospitals: 2.1 Mean RN/patient levels: 2.81 Reduction by 10% in LPN/patient ratio: 2.53 Mean LPN/patient levels: 1.9 Reduction by 10% in LPN/patient ratio: 2.0	4.91 0.69 4.80 0.67 5.14 0.73 4.70 0.73 0.50 0.68 0.51 0.72 0.50 0.68 0.50 0.69 0.51 0.69 0.52 0.71 0.51 0.69 0.51 0.69
			SWI %, Complications %
		State data in 1991 2.9 1.5 1.6 State data in 1992 2.7 1.7 1.7 State data in 1993 2.77 1.8 1.8 State data in 1994 2.7 2.0 1.8 State data in 1995 2.6 2.0 1.8 State data in 1996 2.8 2.1 1.8 State data in 1997 2.7 2.4 1.7 Mean RN/patient levels in medium size hospitals: 2.67 Reduction by 10% in LPN/patient, medium size hospitals: 2.4 Mean LPN/patient levels in medium size hospitals: 1.9 Reduction by 10% in LPN/patient, medium size hospitals: 2.1 Mean RN/patient levels: 2.81 Reduction by 10% in RPN/patient ratio: 2.53 Mean LPN/patient levels: 1.9 Reduction by 10% in LPN/patient ratio 2.0	0.29 2.58 0.26 2.40 0.24 2.47 0.28 2.67 0.28 2.49 0.31 2.79 0.30 2.71 0.27 2.34 0.27 2.37 0.27 2.34 0.27 2.35 0.30 2.69 0.31 2.70 0.30 2.69 0.32 2.70
			Pnm Falls PulmF CPR
		State data in 1991 2.9 1.5 1.6 State data in 1992 2.7 1.7 1.7 State data in 1993 2.7 1.8 1.8 State data in 1994 2.7 2.0 1.8 State data in 1995 2.6 2.0 1.8 State data in 1996 2.8 2.1 1.8 State data in 1997 2.7 2.4 1.7	0.98 0.04 0.52 0.54 0.91 0.04 0.46 0.48 0.96 0.16 0.47 0.50 1.54 0.91 0.63 0.61 1.55 0.86 0.68 0.64 1.63 0.74 0.70 0.63 1.64 0.72 0.69 0.60

Table G5. Evidence of the association between nurse/patient ratio and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse/Patient Ratios	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes		
			UTI	Pnm	Dec Ul %
		Increase by 1 unit in RN/patient ratio	-0.15	0.04	-0.07
		Increase by 1 unit in RN/patient ratio in small hospitals	0.31	0.30	0.06
		Increase by 1 unit in RN/patient ratio in medium hospitals	-0.34	-0.30	-0.15
		Increase by 1 unit in RN/patient ratio in large hospitals	-0.07	0.00	-0.04
		Increase by 1 unit in LPN/patient ratio	-0.10	0.21	0.04
		Increase by 1 unit in LPN/patient ratio in small hospitals	0.24	0.58	0.13
		Increase by 1 unit in LPN/patient ratio in medium hospitals	-0.37	-0.04	-0.12
		Increase by 1 unit in LPN/patient ratio in large hospitals	0.77	0.35	-0.12
		Increase by 1 unit in UAP/patient ratio	-0.09	0.12	0.06
		Increase by 1 unit in UAP/patient ratio in small hospitals	0.00	0.48	0.05
		Increase by 1 unit in UAP/patient ratio in medium hospitals	-0.14	0.14	0.17
		Increase by 1 unit in UAP/patient ratio in large hospitals	0.05	0.01	-0.04
			Falls	PulmF	Pressure ulcer
		Increase by 1 unit in RN/patient ratio	-0.01	-0.02	-0.01
		Increase by 1 unit in RN/patient ratio in small hospitals	0.05	0.12	0.09
		Increase by 1 unit in RN/patient ratio in medium hospitals	-0.02	-0.05	-0.04
		Increase by 1 unit in RN/patient ratio in large hospitals	0.00	-0.12	-0.01
		Increase by 1 unit in LPN/patient ratio	-0.09	0.09	0.03
		Increase by 1 unit in LPN/patient ratio in small hospitals	-0.12	-0.03	0.10
		Increase by 1 unit in LPN/patient ratio in medium hospitals	0.01	0.02	-0.07
		Increase by 1 unit in LPN/patient ratio in large hospitals	0.01	-0.46	0.16
		Increase by 1 unit in UAP/patient ratio	-0.03	0.03	0.00
		Increase by 1 unit in UAP/patient ratio in small hospitals	-0.08	0.19	0.12
		Increase by 1 unit in UAP/patient ratio in medium hospitals	0.05	0.05	-0.03
		Increase by 1 unit in UAP/patient ratio in large hospitals	-0.02	-0.15	-0.01
			SWI	CPR	Complication
		Increase by 1 unit in RN/patient ratio	-0.02	0.00	-0.03
		Increase by 1 unit in RN/patient ratio in small hospitals	-0.09	-0.04	-0.05
		Increase by 1 unit in RN/patient ratio in medium hospitals	0.00	0.00	-0.12
		Increase by 1 unit in RN/patient ratio in large hospitals	-0.02	-0.03	0.00
		Increase by 1 unit in LPN/patient ratio	-0.04	0.02	-0.18
		Increase by 1 unit in LPN/patient ratio in small hospitals	-0.03	-0.05	-0.10
		Increase by 1 unit in LPN/patient ratio in medium hospitals	0.00	0.06	-0.21
		Increase by 1 unit in LPN/patient ratio in large hospitals	0.01	-0.24	-0.52
		Increase by 1 unit in UAP/patient ratio	0.02	0.05	0.18
		Increase by 1 unit in UAP/patient ratio in small hospitals	-0.06	-0.24	-0.23
		Increase by 1 unit in UAP/patient ratio in medium hospitals	0.05	0.06	0.15
		Increase by 1 unit in UAP/patient ratio in large hospitals	0.01	0.05	0.09

Table G5. Evidence of the association between nurse/patient ratio and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse/Patient Ratios	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Unruh[81] Health Care Cost Containment Council Yearly number of occurrences of adverse events per hospital: secondary diagnosis of diseases and disorders of the kidney and urinary tract, male reproductive system, or female reproductive system, decubitus ulcer, fall, atelectasis, infection or sepsis or septicemia following infusion, injection, transfusion, or vaccination, and complications of obstetrical surgical wounds. The Pennsylvania Department of Health (PDH) and the American Hospital Association (AHA) Number of FTE RNs + LPNs on hospital payroll as of June 30th yearly. No. FTE RNs + LPNs + NA on hospital payroll as of June 30th yearly.	Hospitals 1,477 Unit Combined Medical Patients	Reference, 3.3 licensed nurses/patient 10% increase in number of licensed nurses 10% increase in number of licensed nurses 10% increase in number of licensed nurses 10% increase in number of licensed nurses	Relative risk Reference Urinary tract infection 0.99 Pneumonia 1.01 Decubitus ulcer 0.98 Falls 0.97 Pulmonary failure 0.985

BSI = Bloodstream Infection; BSN = Bachelor of Science in Nursing; CPR = Cardiopulmonary Resuscitation; Dec Ul = Decubitus Ulcer; FTE = Full Time Equivalent; ICU = Intensive Care Unit; LPN = Licensed Practical Nurse; NA = Nursing Assistants; NS = Not Significant; Pnm = Pneumonia; PulmF = Pulmonary Failure; RN = Registered Nurse; SD = Standard Deviation; SICU = Surgical Intensive Care Unit; SWI = Surgical Wound Infection; UAP = Unlicensed Assistive Personnel; UTI = Urinary Tract Infection

Table G6. Patient outcomes corresponding to an increase by one patient/RN/shift (effects reported by authors and calculated from published results, more studies contributed to pooled analysis)

Author	Outcome	Measure	Effect	Standard Error	Significance
Pronovost[72]	Pulmonary failure	Relative risk	0.61	0.14	0.05
Pronovost[72]	Unplanned extubation	Relative risk	0.22	0.02	0.01
Pronovost[72]	CPR	Relative risk	0.22	0.05	0.05
Pronovost[72]	Complications	Relative risk	0.22	0.05	0.05
Pronovost[72]	Medical complications	Relative risk	0.29	0.08	0.08
Pronovost[72]	Surgical complications	Relative risk	-0.12	0.06	0.21
Pronovost[72]	Sepsis	Relative risk	0.24	0.08	0.09
Pronovost[72]	Bleeding	Relative risk	-0.01	0.10	0.93
Dang[75]	Pulmonary failure	Relative risk	0.43	0.24	0.13
Dang[75]	Unplanned extubation	Relative risk	0.41	0.11	0.01
Dang[75]	CPR	Relative risk	0.18	0.12	0.19
Dang[75]	Complications	Relative risk	0.06	0.14	0.69
Dang[75]	Medical Complications	Relative risk	0.18	0.12	0.19
Dang[75]	Sepsis	Relative risk	0.06	0.14	0.69
Amaravadi[64]	CPR	Rate	0.40		
Amaravadi[64]	Hospital acquired pneumonia	Rate	4.00		
Amaravadi[64]	Sepsis	Rate	2.20		
Amaravadi[64]	Pulmonary failure	Rate	1.50		
Amaravadi[64]	Unplanned extubation	Rate	6.50		
Amaravadi[64]	Hospital acquired pneumonia	Relative risk	0.44		
Amaravadi[64]	Pulmonary failure	Relative risk	0.09		
Amaravadi[64]	Unplanned extubation	Relative risk	0.46		
Amaravadi[64]	CPR	Relative risk	0.09		
Amaravadi[64]	Medical complications	Relative risk	-0.05		
Amaravadi[64]	Surgical complications	Relative risk	-0.05		
Amaravadi[64]	Sepsis	Relative risk	0.65		
Dimick[70]	CPR	Rate	0.10		
Dimick[70]	Hospital acquired pneumonia	Rate	0.70		
Dimick[70]	Sepsis	Rate	1.35		
Dimick[70]	Pulmonary failure	Rate	2.10		
Dimick[70]	Unplanned extubation	Rate	4.45		
Dimick[70]	Hospital acquired pneumonia	Relative risk	0.17		
Dimick[70]	Pulmonary failure	Relative risk	0.64		
Dimick[70]	Unplanned extubation	Relative risk	0.87		
Aiken[39]	Failure to rescue	Rate	0.41	0.16	0.03
Aiken[39]	Failure to rescue	Relative risk	0.05		
Aiken[39]	Failure to rescue	Relative risk	0.08	0.00	0.00
Marcin[3]	Unplanned extubation	Relative risk	1.44		
Elting[92]	Failure to rescue	Relative risk	-0.18		
Flood[53]	Urinary tract infection	Rate	0.02		
Flood[53]	Nosocomial infection	Rate	0.03		
Fridkin[1]	Nosocomial infection	Rate	41.06		
Fridkin[1]	Sepsis	Rate	10.64		
Fridkin[1]	Sepsis	Relative risk	3.99	0.58	0.02
Mark[89]	Urinary tract infection	Relative risk	0.00	0.01	0.69
Mark[89]	Hospital acquired pneumonia	Relative risk	0.02	0.02	0.36
Donaldson[9]	Falls	Rate	0.43	0.21	0.17
Donaldson[9]	Pressure ulcers	Rate	-0.82	0.89	0.46
Bolton[26]	Falls	Rate	5.35		
Bolton[26]	Pressure ulcers	Rate	-1.47		
Silber[67]	Failure to rescue	Rate	36.71		
Silber[67]	Failure to rescue	Relative risk	0.06		
Silber[67]	Complications	Relative risk	-0.03		
Hope[96]	Urinary tract infection	Rate	-0.71	0.43	0.12

Table G6. Patient outcomes corresponding to an increase by one patient/RN/shift (effects reported by authors and calculated from published results, more studies contributed to pooled analysis) (continued)

Author	Outcome	Measure	Effect	Standard Error	Significance
Hope[86]	Nosocomial infection	Rate	-0.03	0.03	0.31
Hope[86]	Sepsis	Rate	-0.10	0.10	0.34
Hope[86]	Urinary tract infection	Relative risk	-0.01	0.00	0.18
Hope[86]	Hospital acquired pneumonia	Relative risk	0.07	0.02	0.00
Hope[86]	Nosocomial infection	Relative risk	0.02	0.02	0.17
Hope[86]	Surgical wound infection	Relative risk	0.02	0.04	0.67
Hope[86]	Sepsis	Relative risk	0.02	0.03	0.42
Houser[49]	Failure to rescue	Rate	0.23	0.30	0.48
Houser[49]	Pulmonary failure	Rate	0.01	0.01	0.65
Houser[49]	Deep venous thrombosis	Rate	0.01	0.03	0.69
Houser[49]	Failure to rescue	Relative risk	0.03		
Houser[49]	Pulmonary failure	Relative risk	0.02		
Houser[49]	Deep venous thrombosis	Relative risk	0.06		
Halm[51]	Failure to rescue	Relative risk	0.00	0.00	0.00
Simmonds[82]	Nosocomial infection	Rate	-13.35	10.40	0.25
Unruh[66]	CPR	Rate	-0.32	0.03	<.0001
Unruh[66]	Falls	Rate	-0.24	0.12	0.08
Unruh[66]	Urinary tract infection	Rate	-2.13	0.58	0.00
Unruh[66]	Hospital acquired pneumonia	Rate	-0.71	0.13	0.00
Unruh[66]	Surgical wound infection	Rate	-0.17	0.02	<.0001
Unruh[66]	Pulmonary failure	Rate	-0.33	0.04	<.0001

Table G7. Patient outcomes corresponding to an increase by one patient/LPN (effects reported by authors and calculated from published results, more studies contributed to pooled analysis)

Author	Outcome	Measure	Effect	Standard Error	Significance
Needleman[28]	Failure to rescue	Rate	-0.07	0.07	0.36
Needleman[28]	Urinary tract infection	Rate	-0.07	0.04	0.10
Needleman[28]	Hospital acquired pneumonia	Rate	-0.06	0.03	0.03
Needleman[28]	Sepsis	Rate	0.00	0.01	0.86
Needleman[28]	Surgical wound infection	Rate	0.01	0.01	0.42
Needleman[28]	Pressure ulcers	Rate	-0.04	0.04	0.34
Needleman[28]	Upper gastrointestinal bleeding	Rate	-0.01	0.01	0.33
Needleman[28]	Shock	Rate	-0.01	0.01	0.14
Needleman[28]	Pulmonary failure	Rate	-0.05	0.04	0.21
Needleman[28]	Deep venous thrombosis	Rate	0.00	0.00	0.27
Kovner[35]	Urinary tract infection	Rate	-0.02	0.02	0.31
Kovner[35]	Hospital acquired pneumonia	Rate	0.02	0.01	0.32
Kovner[35]	Pulmonary failure	Rate	0.00	0.01	0.93
Kovner[35]	Deep venous thrombosis	Rate	-0.04	0.02	0.12
Langemo[41]	Pressure ulcers	Rate	0.49	0.33	0.37
Mark[89]	Urinary tract infection	Relative risk	-0.04	0.01	0.05
Mark[89]	Hospital acquired pneumonia	Relative risk	0.12	0.02	0.00
Bolton[26]	Falls	Rate	1.60		
Bolton[26]	Pressure ulcers	Rate	-0.44		
Unruh[66]	CPR	Rate	0.03	0.00	<.0001
Unruh[66]	Falls	Rate	0.03	0.01	0.00
Unruh[66]	Urinary tract infection	Rate	0.14	0.06	0.03
Unruh[66]	Hospital acquired pneumonia	Rate	0.06	0.01	<.0001
Unruh[66]	Surgical wound infection	Rate	0.01	0.00	<.0001
Unruh[66]	Pulmonary failure	Rate	0.04	0.01	<.0001
Zidek[85]	Falls	Rate	0.02	0.08	0.77
Zidek[85]	Pressure ulcers	Rate	-0.01	0.04	0.82
Tallier[83]	Urinary tract infection	Rate	0.81	0.32	0.07
Tallier[83]	Pressure ulcers	Rate	-0.38	0.33	0.31

Table G8. Patient outcomes corresponding to an increase by one patient/UAP (effects reported by authors and calculated from published results, more studies contributed to pooled analysis)

Author	Outcome	Measure	Effect	Standard error	Significance
Needleman[28]	Failure to rescue	Rate	0.14	0.41	0.73
Needleman[28]	Urinary tract infection	Rate	-0.19	0.22	0.39
Needleman[28]	Hospital acquired pneumonia	Rate	-0.15	0.15	0.33
Needleman[28]	Sepsis	Rate	0.04	0.06	0.48
Needleman[28]	Surgical wound infection	Rate	0.02	0.03	0.57
Needleman[28]	Pressure ulcers	Rate	0.06	0.25	0.81
Needleman[28]	Gastrointestinal bleeding	Rate	-0.04	0.05	0.36
Needleman[28]	Shock	Rate	-0.02	0.04	0.60
Needleman[28]	Pulmonary failure	Rate	0.01	0.19	0.97
Needleman[28]	Deep venous thrombosis	Rate	-0.03	0.02	0.11
Potter [40]	Falls	Rate	0.28	0.50	0.64
Sovie[71]	Falls	Rate	-0.08	0.34	0.82
Sovie[71]	Urinary tract infection	Rate	-0.17	0.13	0.26
Sovie[71]	Pressure ulcers	Rate	-0.25	0.26	0.41
Ritter-Teitel[69]	Falls	Rate	-0.07	0.04	0.18
Ritter-Teitel[69]	Urinary tract infection	Rate	-0.41	0.02	<.0001
Ritter-Teitel[69]	Pressure ulcers	Rate	0.25	0.13	0.12
Unruh[66]	CPR	Rate	0.03	0.00	<.0001
Unruh[66]	Falls	Rate	0.03	0.01	0.02
Unruh[66]	Urinary tract infection	Rate	0.28	0.02	<.0001
Unruh[66]	Hospital acquired pneumonia	Rate	0.07	0.01	0.00
Unruh[66]	Surgical wound infection	Rate	0.02	0.00	<.0001
Unruh[66]	Pulmonary failure	Rate	0.03	0.00	<.0001
Zidek[85]	Falls	Rate	0.00	0.01	0.97
Zidek[85]	Pressure ulcers	Rate	0.00	0.01	0.44
Stratton[91]	Nosocomial infection	Rate	0.04	0.11	0.70
Tallier[83]	Urinary tract infection	Rate	0.21	3.58	0.96
Tallier[83]	Pressure ulcers	Rate	-1.23	2.57	0.66

Table G9. The association between nurse staffing and length of stay

Author, Definition of Length of Stay, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Length of Stay
Amaravadi[64] The Uniform Health Discharge Data Set; hospital length of stay, survey of ICU directors; average nurse-to-patient ratio of ≥1:2 versus <1:2 both during the day and at night	Hospitals 1 Unit ICU Patients Surgical	Night time nurse to patient ratio <1:2 Night time nurse to patient ratio >1:2 Night time nurse to patient ratio <1:2 Night time nurse to patient ratio >1:2	15 9 Relative increase in length of stay 1.39 1.19 1.61 1 1 1
ANA[65] Uniform Hospital Discharge Data Set; an average length of stay in hospital, American Hospital Association survey, hospitals cost reports; total nursing hours per Nursing Intensity Weight, % RN Hours/total nursing hours		Increase by 1 hour in total nursing hours in Massachusetts, 1992 Massachusetts, 1994 New York, 1992 New York, 1994 California, 1992 California, 1994 Increase by 1% in RN in Massachusetts, 1992 Massachusetts, 1994 New York, 1992 New York, 1994 California, 1992 California, 1994	Relative increase in length of stay 0.903 1 0.9354 0.956 0.9518 0.946 0.9973 0.9981 0.9981 0.9989 0.9993 0.9984
Barkell[77] Medical records; length of stay in the unit: the number of midnights a patient was on the unit as an inpatient, hospital administrative database, proportion of RN/total nursing staff	Hospitals 1 Unit Surgical Patients Surgical	Team nursing model with patient care associate assisting RNs in delivery of patient care (66% of RN) Total patient care model, 79% RN	Length of stay, days ± SD 6.8 ± 3.1 7.1 ± 2.9

Table G9. The association between nurse staffing and length of stay (continued)

Author, Definition of Length of Stay, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Length of Stay
Beckman[37] Medical records, length of stay in unit, unit administrators and nurses survey, hospital administrative data; scheduled RNs/patients in unit, % of RN/total nursing personnel	Hospital 1 Unit ICU	 RN + Case manager RN + MSW RN + Clinical nurse specialist RN + mixed support (rehabilitation nurse) Advanced practice nurse + clinical nurse specialist Advanced practice nurse + social worker Advanced practice nurse + mixed support RN staff with no support	Length of stay, days ± SD 29 ± 32.6 35 ± 42 11 ± 2.1 17 ± 8.5 11 ± 6 7 ± 0 14 ± 0 9 ± 7.4
	Unit	Patient/RN % RN	
	Surgical	0.86 60	13.25 ± 5.73
	Surgical	0.85 66	7.92 ± 6.64
	Specialty	0.63 69	28.53 ± 33.72
	Medical	1.04 61.5	10.50 ± 5.87
	Medical	1.16 58.5	9.77 ± 8.17
	Surgical	0.91 69	12.29 ± 9.42
	Surgical	1.39 57	4.23 ± 3.00
Cho[30] The State Inpatient Databases in hospital length of stay, Hospital Financial Data; the total productive hours worked by RN per patient day; contracted hours = productive nursing hours (direct care to patient) worked by nursing personnel contracted on a temporary basis. Contract hours * % of RN; RN hours divided by all hours	Unit Combined Patients Combined	RN hours % RN % contract hours	Length of stay, days ± SD
		7.2 76.5 3.60	8.6 ± 1.5
		6 68.1 3.30	7.2 ± 1.3
		6.6 72.4 3.20	7.6 ± 9
		6.2 72.7 5.00	7.8 ± 1.5

Table G9. The association between nurse staffing and length of stay (continued)

Author, Definition of Length of Stay, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Length of Stay
Cimiotti[87] Patients discharges and medical records review by study's nurse epidemiologist; the length of stay as the 1 day of admission and all succeeding days except the day of discharge, nurse staffing office and sign-in/out sheet from each supplemental nursing agency; total nursing hours worked by direct care providers adjusted for Nursing Intensity Weights categorized as below and above median; RN hours/patient day adjusted for Nursing Intensity Weights categorized as below and above median; % of RN hours among total nursing hours adjusted for Nursing Intensity Weights; hours/patient day worked by float pool and agency RN not regularly assigned to the NICU	Hospitals 1 Unit Neonatal Patients Medical	Nurse hours RN hours % RN 10.68 10.68 100 10.97 10.56 96 8.705 12.95 8.5 12.74 % of contract nurses 0.19 24.07 14.19 12.13	Length of stay, days ± SD 17.23 ± 24.39 19.6 ± 28.28 10.01 ± 13.45 21.3 ± 29.03 15.75 ± 24.47 18.05 ± 24.69 17.23 ± 24.39 19.6 ± 28.28 12.52 ± 16.09 17.1 ± 30.75
Dimick[70] The Uniform Health Discharge Data Set; In-hospital length of stay; survey of ICU directors; average nurse-to-patient ratio in the ICU during the day and evening and at night.	Hospitals 32 Unit ICU Patients Surgical	More nurses: RNs/patient 1:1-1:2 Fewer nurses: RNs/patient 1:1-3-1:4	Relative increase in length of stay 1 1 1 1.09 0.89 1.12
Flood[53] Patient medical records; length of stay in unit, staffing workload index; RN FTE/patient per shift per unit	Hospitals 1 Unit Combined Patients Medical	Nurse hours % RN 6.9 60.45 6.7 42.32	Length of stay, days ± SD 8.56 ± 7.81 9.49 ± 8.74
Gandjour[24] Health Care Financing Administration database; average hospital length of stay; Joint Annual Report of Hospital Data; number of administrative full time employees RN (FTE)/1,000 patient days	Hospitals 77 Unit Combined Patients Combined	Nurse hours Patients/nurse 19 2.86 19 2.85 8.9 3.22 8.4 3.44 4 3.2	Length of stay, days 5.49 5.54 5.43 5.13 5.29

Table G9. The association between nurse staffing and length of stay (continued)

Author, Definition of Length of Stay, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Length of Stay
Grillo-Peck[10] Review of risk management records and medication records 6 months before and after implementation of nursing model; length of stay in unit; hospital administrative records; decrease in % of RN in the unit within new partnership model with increase patient care technicians and service associates; RN spent more time on direct patient care	Hospitals 1 Unit Specialized Patients Medical	% RN 80 60	Length of stay, days 9.46 8.76
Halpine[14] The Hospital Medical Records Institute database; in average length of stay in units; The Hospital Medical Records Institute; GRASP workload system; total nursing hours/patient day	Hospitals 5 Unit Patients Spec Medical Surgical Surgical Surgical Surgical Surgical Surgical Surgical Surgical Surgical Surgical Neonatal Medical Surgical Surgical Specialty Surgical Surgical Surgical Surgical Surgical Surgical Surgical Surgical Surgical Neonatal Medical ICU Medical Surgical Surgical ICU Medical Specialty Medical Specialty Medical Medical Medical Surgical Surgical Surgical Surgical Medical Medical Medical Medical Neonatal Medical Surgical Surgical Medical Medical Surgical Surgical	Hour 8.64 8.51 7.57 6.92 6.64 6.56 6.32 6.14 6.07 5.87 5.78 5.78 5.47 4.67 4.66 4.58 4.52 4.51 4.41 4.38 9.28 9.19 7.51 7.32 6.49 6.33 6.32 6.15	Length of stay, days 39.25 1.86 13.33 15 9.24 12.2 7.58 21.79 19.79 16.71 14.31 26.5 2.19 4.74 12.34 6.72 10.1 12.49 17.86 6.67 9.75 10.76 2.56 1.32 3.06 1.52 3.34 2.1

Table G9. The association between nurse staffing and length of stay (continued)

Author, Definition of Length of Stay, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions		Nurse Staffing Categories		Length of Stay
	Neonatal	Medical	6.01		2.52
	Medical	Medical	5.78		4.42
	Medical	Surgical	5.59		2.17
	Medical	Medical	5.58		4.33
	Surgical	Surgical	5.53		9
	Neonatal	Medical	5.49		2.26
	Neonatal	Medical	5.45		2.86
	ICU	Medical	5.41		9.42
	Medical	Medical	5.34		2.75
	Surgical	Surgical	5.13		17.11
	Specialty	Medical	5.1		2.6
	Surgical	Surgical	5.06		3.23
Hoover[23] The Health Care Financing Agency, HealthCareReportCards.com; MEDPAR database, the Medicare Average Length of Stay (ALOS) = total number of Medicare discharge days/total number of Medicare discharges for each hospital. The AHA and HCFA databases; RN/LPN ratio = total number RN FTE/LPN FTE reported by the hospital and RN/total nursing staff	Unit	Combined			Length of stay, days ± SD
	Patients	Medical	% RN		
	Hospitals	54	79.6		5.67 ± 0.36
		52	69.8		5.69 ± 0.67
		70	72.83		6.31 ± 0.47
		176	81.8		5.82 ± 0.09
		176	62.9		6.18 ± 0.09
Houser[49] Nationwide Inpatient Sample of 2001 with hospital discharge records; average length of stay in the hospital in days; American Hospital Association Annual Survey for 2001; hospital reported RN FTE/RN + LPN	Unit	Combined			
	Patients	Medical			LOS, days ± SD
	Hospitals	170	RN/patient ratio	0.15-1.29	4.64 ± 2.68
		172	RN/patient ratio	1.3-1.89	4.54 ± 0.97
		174	RN/patient ratio	1.9-2.49	4.38 ± 2.59
		171	RN/patient ratio	2.5-6.5	3.84 ± 2.19
		39	RN/patient ratio	3.5-4.41	4.08 ± 4
		14	RN/patient ratio	4.57-5.5	3.47 ± 1.25
		8	RN/patient ratio	5.67-7.67	2.76 ± 0.88

Table G9. The association between nurse staffing and length of stay (continued)

Author, Definition of Length of Stay, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Length of Stay
Lichtig[63] The Uniform Hospital Discharge Data Set; The California Office of Statewide Health Planning and Development; the Statewide Planning and Research Cooperative System Administratively Releasable file; a relative length of stay (LOS) index was calculated as the ratio of the actual-to-expected geometric mean LOS; The Annual Hospital Disclosure Report, Institutional Cost Reports; total nursing hours per NIW-adjusted patient day; RN hours as a percentage of total nursing hours per NIW-adjusted patient day.	Unit Surgical Patients Surgical Hospitals 126 131 352 295 126 131 352 295	Increase by 1 hour in total nursing hours in New York, 1992 12.50 New York, 1994 13.00 California, 1992 12.00 California, 1994 6.50 New York,1992 13.50 New York, 1994 12.80 Increase by 1% in proportion of RNs, California, 1992 Increase by 1% in proportion of RNs, California, 1994	Relative change in length of stay 0.94 0.96 0.95 0.95 1.00 1.00 Not significant Not significant
Mark[90] Centers for Medicare Services, Minimum Cost and Capital File, CMS Provider of Services File, CMS Case Mix Index File, CMS Online Survey; Certification and Reporting system (OSCAR) files, and HCUP files. risk-adjusted ratio of observed/expected length of stay; Area Resource Files, American Hospital Association Annual Survey, CMS Wage Rate File, CMS Online Survey; Certification and Reporting system (OSCAR) files; RN FTEs/1,000 in-patient days, RN hours/patient * day = (FTE RN/1,000patient * days * 37.5 * 48)/1,000; 37.5 hours work week in average 48 working weeks/year, LPN FTEs/1,000 in-patient days, LPN hours/patient * day = (FTE LPN/1,000 patients * days * 37.5 * 48)/1,000; 37.5 hours work week in average 48 working weeks/year	Unit Patients Combined Medical	Pt/RN RN hours Pt/LPN LPN hours 0.31 5.74 1.32 1.36 0.31 5.88 1.57 1.15 0.28 6.36 1.81 0.99 0.27 6.59 1.87 0.96 Increase by 1 RN FTE/1,000 patient days in hospitals with high HMO penetration Increase by 1 LPN FTE/1,000 patient days in hospitals with high HMO penetration Increase by 1 RN FTE/1,000 patient days in hospitals with low HMO penetration Increase by 1 LPN FTE/1,000 patient days in hospitals with low HMO penetration Nurse hours Patient/RN RN hours 14.60 0.38 4.79 9.60 0.30 6.01 17.60 0.25 7.24 7.80 0.38 4.79 10.90 0.30 6.01 0.25 7.24	Relative change in length of stay 0.78 0.76 0.78 0.83 0.82 0.83 0.81 0.79 0.81 0.80 0.79 0.80 0.97 0.95 0.99 1.03 0.98 1.09 0.99 0.97 1.01 1.04 0.99 1.09 0.99 0.99 1.00 0.99 0.99 1.00 1.00 0.99 1.00 1.00 0.99 1.01 1.00 0.99 1.00 1.00 0.99 1.00

Table G9. The association between nurse staffing and length of stay (continued)

Author, Definition of Length of Stay, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Length of Stay
Mark[80] The hospital's incident reporting system and patient survey; total patient days divided by the number of discharges, administrative hospital data, nursing survey; proportion of RNs to the total complement of nursing staff, as a ratio of the number of nurses who left during the period divided by the number of nurses employed at the end of the year; availability of support services was evaluated with a 27-item, 3-point checklist 24 in which staff nurses (n = 1,682) indicated whether a variety of support services was available, not available, or inconsistently available (alpha =.85)	Hospitals 64 Unit Combined Patients Medical	Nurse hours % RN % BSN 10.00 58.00 21.00	Length of stay, days ± SD 5.31 ± 1.47
Melberg[20] Hospital discharge data; average length of stay in hospital; hospital administrative data; FTE RN/100 occupied bed in acute units; % of RN/total nursing personnel	Hospitals 1 Unit ICU Patients Medical	Patient/RN % RN 0.41 96.00 0.44 73.00 0.36 64.00 0.42 76.00 0.42 82.00	Length of stay, days 5.97 6.70 6.15 5.20 6.30
Needleman[28] 799 hospitals (11 states, all-patients + Medicare patients) – hospital level analysis; 256 California hospitals (part of the 11 state sample) – unit level analysis; national sample of 3,357 hospitals (Medicare patients) - hospital level analysis; length of stay in hospital; nurse hours calculation: (2,080 hours * each FTE category) + (1,040 hours * number of part-time employees). Total nursing hours/patient-day NIW adjusted including RNs, clinical nurse specialists, general duty nurses, nurse practitioner excluding nursing directors, managers, administrators,	Hospitals Patient 32 Medical 280 Medical 83 Medical 128 Medical 68 Medical 86 Medical 145 Medical 154 Medical 25 Medical 127 Medical 488 Medical 3,357 Medical 3,296 Surgical 127 Surgical 280 Surgical 83 Surgical	 Nevada New York Maryland Virginia West Virginia South Carolina Wisconsin Missouri Arizona Massachusetts California Medicare patients Medicare patients Massachusetts New York Maryland	Length of stay, days ± SD 4.5 ± 1.26 6.31 ± 1.42 4.34 ± 0.70 4.62 ± 1.16 5.72 ± 1.57 4.71 ± 0.72 4.03 ± 0.84 5.38 ± 1.67 3.63 ± 0.92 4.79 ± 1.10 4.81 ± 2.71 5.79 ± 2.92 7.68 ± 2.90 4.15 ± 0.59 5.35 ± 0.97 4.25 ± 0.92

Table G9. The association between nurse staffing and length of stay (continued)

Author, Definition of Length of Stay, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions		Nurse Staffing Categories	Length of Stay		
supervisors, instructors, anesthetists, and midwifes; RN hours/patient day NIW adjusted; licensed hours/patient-day NIW adjusted including LPN/LVN, excluding the director of nursing. LPN/LVN hours/patient day NIW adjusted; RN hours per day/total hours per day; RN hours/licensed hours = RN hours per day/licensed hours per day (RN + LPN)	128	Surgical	Virginia	4.32 ± 0.92		
	68	Surgical	West Virginia	8.09 ± 3.15		
	86	Surgical	South Carolina	4.62 ± 1.10		
	145	Surgical	Wisconsin	4.38 ± 0.74		
	154	Surgical	Missouri	4.52 ± 0.76		
	25	Surgical	Arizona	3.91 ± 0.50		
	32	Surgical	Nevada	5.35 ± 0.79		
	488	Surgical	California	4.27 ± 1.19		
				Relative change in length of stay		
	4,156	Medical	Increase by 1 hour of RN hours	0.90	0.86	0.93
	4,156	Surgical	Increase by 1 hour in RN hours	0.97	0.95	1.00
	4,156	Medical	Increase by 1 hour in LPN hours	0.98	0.91	1.05
	4,156	Surgical	Increase by 1 hour in LPN hours	1.05	0.94	1.18
	4,156	Medical	Increase by 1 hour in aide hours	1.07	1.02	1.13
	4,156	Surgical	Increase by 1 hour in aide hours	1.00	0.95	1.06
	4,156	Medical	Increase by 1 hour in total nursing hrs	0.95	0.92	0.98
	4,156	Surgical	Increase by 1 hour in total nursing hrs	0.99	0.96	1.02
	4,156	Medical	Increase by 1% in RNs	0.12	0.05	0.29
	4,156	Surgical	Increase by 1% in RNs	0.84	0.39	1.78
	4,156	Medical	Increase by 1 hour in licensed hour	0.91	0.88	0.94
	4,156	Medical	increase by 1% of RN/licensed hour	0.28	0.12	0.65
	4,156	Surgical	Increase by 1 hour in licensed hour	0.99	0.96	1.02
	4,156	Surgical	Increase by 1% in RN/licensed hour	0.48	0.20	1.17
	3,357	Medical	Increase by 1 hour in RN hours	0.94	0.92	0.96
	3,357	Medical	Increase by 1 hour in LPN hours	0.99	0.97	1.02
	3,357	Medical	Increase by 1 hour in licensed hours	0.95	0.93	0.97
	3,357	Medical	Increase by 1% in RN/licensed hours	0.45	0.28	0.73
	3,357	Medical	Increase in total nurse hours	0.94	0.90	0.98
	3,357	Medical	Increase by 1% in RNs	0.07	0.03	0.19
	3,357	Medical	Increase by 1 hours in aide hours	1.09	1.02	1.17
	3,357	Surgical	Increase by 1 hour in RN hours	0.98	0.95	1.00
	3,357	Surgical	Increase by 1 hour in LPN hours	0.97	0.93	1.02
	3,357	Surgical	Increase by 1 hour in licensed hours	0.98	0.95	1.00
	3,357	Surgical	Increase by 1% in RN/licensed hours	0.93	0.51	1.72
	3,357	Surgical	Increase by hour in aide hours	0.99	0.92	1.07
	3,357	Surgical	Increase by 1 hour in total nursing hrs	0.64	0.41	0.99
	3,357	Surgical	Increase by 1% in RNs	0.73	0.17	3.11
			California hospitals			
	256	Medical	Increase by hour in RN hours	0.80	0.64	1.00
	256	Medical	Increase by 1 hour in LPN hours	1.54	0.60	3.92
	256	Medical	Increase by 1 hour in aide hours	0.99	0.78	1.25

Table G9. The association between nurse staffing and length of stay (continued)

Author, Definition of Length of Stay, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Length of Stay		
	256 Medical	Increase by 1 hour in nursing hours	0.92	0.76	1.11
	256 Medical	Increase by 1% in RNs	0.00	0.00	0.89
	256 Medical	Increase by 1 hour of licensed hours	0.47	0.24	0.96
	256 Medical	Increase by 1% of RNs/licensed hour	0.00	0.00	0.11
	256 Medical	Increase by 1 hour of RN hours	0.71	0.56	0.90
	256 Medical	Increase by 1 hour in LPN hours	1.14	0.57	2.29
	256 Medical	Increase by 1 hour in aide hours	0.93	0.65	1.33
	256 Medical	Increase by 1 hour nursing hours	0.82	0.70	0.96
	256 Medical	Increase by 1% in RNs	0.00	0.00	0.70
	256 Medical	Increase by 1 hour/licensed hour	0.19	0.04	0.83
	256 Medical	Increase by 1% of RN hours/licensed hr	0.01	0.00	0.16
	256 Surgical	Increase by 1 hour of RNs	1.00	0.97	1.03
	256 Surgical	Increase by 1 hour in LPN hours	1.20	1.00	1.44
	256 Surgical	Increase by 1 hour in aide hours	0.92	0.80	1.05
	256 Surgical	Increase by 1 hour in total nursing	1.00	0.97	1.02
	256 Surgical	hours Increase by 1% in RNs	0.16	0.03	1.04
	256 Surgical	Increase by 1 hour in licensed hours	1.03	0.99	1.07
	256 Surgical	Increase by 1% in RNs	0.31	0.08	1.22
		Unit level analysis:			
	256 Surgical	Increase by 1 hour of RN hours	1.00	0.95	1.04
	256 Surgical	Increase by 1 hour in LPN hours	3.12	1.14	8.52
	256 Surgical	Increase by 1 hour in aide hours	0.89	0.78	1.02
	256 Surgical	Increase by 1 hour in total nursing hours	0.98	0.93	1.03
	256 Surgical	Increase by 1% in RNs	2.47	0.86	7.12
	256 Surgical	Increase by 1 hour in licensed hours	1.02	0.97	1.06
	256 Surgical	Increase by 1% in RNs	0.48	0.18	1.26
Needleman[43]	Hospitals 799		Relative change in length of stay		
Hospital discharge data from 11	Unit Combined	1% increase in RN hours/licensed hour	0.24	0.10	0.57
states (all patients and Medicare	Patients Medical	Increase in 1 licensed hour	0.99	0.96	1.01
sample) and MedPAR national		Increase in 1 licensed hour	0.97	0.94	1.00
database (all Medicare patients);		1% increase in RN hours/licensed hour	0.94	0.51	1.73
adjusted length of stay; state		Increase in 1 licensed hour	0.99	0.93	1.05
hospital staffing surveys or financial		1% increase in RN hours/licensed hour	0.46	0.15	1.38
reports. American Hospital		1% increase in RN hours/licensed hour	0.58	0.25	1.35
Association Annual Survey;		Increase in 1 licensed hour	0.95	0.93	0.97
Licensed hours (RN + LPN)/patient		1% increase in RN hours/licensed hour	0.44	0.33	0.59
days adjusted for nursing case-mix		Increase in 1 licensed hour	0.87	0.83	0.91
index for each hospital, proportion of		Increase in 1 licensed hour	0.91	0.88	0.94
RN hours/licensed hours (RN +		1% increase in RN hours/licensed hour	0.11	0.04	0.36
LPN) adjusted for nursing case-mix		1% increase in RN hours/licensed hour	0.33	0.14	0.79
index for each hospital		Increase in 1 licensed hour	0.91	0.88	0.95

Table G9. The association between nurse staffing and length of stay (continued)

Author, Definition of Length of Stay, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Length of Stay
Oster[31] Electronic medical records system; length of stay in the hospital for each patient; hospital administrative daily statistic reports; total productive nursing hours/patient day; total number of productive hours worked by nursing personnel with direct patient care/number of patients; % of RN hours/total nursing hours per patient day; % of contract agencies nurses; % of full time nurses	Hospitals 1 Unit Patients Emergency Medical Surgical Surgical Surgical Surgical Intensive Care Unit Medical Intensive Care Unit Medical Specialty Medical Specialty Medical	% RN % contract hrs % full-time hrs 67.00 18.30 70.00	Length of stay, Days ± SD 5.24 ± 3.95 0.03 -0.02 -0.02 0.01 -0.19 -0.11
Pronovost[72] The Uniform Health Discharge Data Set; Hospital length of stay, survey to the ICU directors, average ICU nurse-to-patient ratio during the day and evening	Unit ICU Patients Surgical Hospitals 7 31 7 31	More nurses: RNs/patient 1:1 or 1:2, adjusted Fewer nurses: RNs/patient 1:3 or 1:4, adjusted	Length of stay, days Unit Hospital 3.00 8.00 3.00 8.00
Pronovost[61] The Uniform Hospital Health discharge Data Set; in-hospital length of stay; in ICU length of stay; survey of ICU directors; average nurse to patient ratio in day, in evening. decreased nurse to patient ratio in evening	Unit ICU Patients Surgical Hospitals 8 31 14 25	Nurse to patient ratio <1:2 during the day Nurse to patient ratio >1:2 during the day Nurse to patient ratio <1:2 in evening Nurse to patient ratio >1:2 in evening	Relative change in length of stay in unit 1.49 1.17 1.91 1.00 1.00 1.00 Relative change in LOS in hospital 9.60 1.20 1.07 8.00 1.00 1.00
Ridge[25] Patient survey 2 weeks after discharge with computerized phone interview system; length of stay in hospital; hospital administrative database, finance reports, Health Care Information Access database, unit nurse manager reports; educational level by degree learned: AD, BSN; number of individual staff hired annually/total number of staff, staffing adequacy - RN worked hours/RN target hours	Hospitals 1 Unit Surgical Patients Surgical	% BSN Experience % full time 44.00 8.70 86.00	Length of stay, Days ± SD 4.10 ± 3.90

Table G9. The association between nurse staffing and length of stay (continued)

Author, Definition of Length of Stay, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Length of Stay
Shamian[15] The National Comparative Database for Nursing Resource Consumption; average length of stay in unit. GRASP work Load Measurement System, The National Comparative Database for Nursing Resource Consumption; the amount of nursing services for each patient during 24 hours	Hospitals 58	Rehabilitation units Psychiatric units Neonatal units Pediatric units Obstetrics Oncology Neurological Intensive Care Unit Medical surgical Orthopedics Cardiac step-down	Length of stay, days 24.8 12.5 14.0 3.7 3.0 7.9 6.6 3.8 6.6 6.1 6.0
Shortell[94] Hospitals discharge data; length of stay in unit for survivors (observed length of stay/expected length of stay) hospital administrative databases; survey of nursing directors in each unit	Hospitals 40 Unit ICU Patients Medical	Increase by 1 RN/patient ratio	Relative change in length of stay 1.06
Stratton[91] Medical records, hospital incidence and infection control records, surveys; average length of stay in units; payroll records from the National Association of Children's Hospitals and Related Institutions (NACHRI); average in each quarter 2002 of total hours of productive nursing care/patient day adjusted for short-stay patients; average in each quarter 2002 of % of RN productive hours/total nursing hours/patient day; % of RN productive hours worked by supplemental nurse staffing (total nursing overtime hours and percentages of hours from float/agency/traveler RN hours)	Hospitals Unit Patients 7 Combined Combined 7 Specialty Surgical 7 ICU Medical	Experience Medical/Surgical units 7.6 years Oncology units 6.6 years ICU units 8.3 years	Length of stay, Days ± SD 3.58 ± 0.94 4.47 ± 0.77 6.48 ± 4.80

Table G9. The association between nurse staffing and length of stay (continued)

Author, Definition of Length of Stay, Definition of Nurse Staffing	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Length of Stay
Tschannen[48] Patients medical records; patient's episode of care on the study unit; actual patients days were calculated as the time from admission to the time of discharge from the unit; nursing surveys, daily staff assignment sheets, census logs, and payroll records; proportion of RNs working in the unit; self reported years working in the present job category	Hospitals 2 Unit ICU Patients Medical	Experience in years 15.91 12.58 7.42 10.31 Increase by 1 hour in total nursing hours Increase by 1% in RNs	Length of stay, Days ± SD 2.67 ± 2.20 2.83 ± 2.10 2.86 ± 2.20 3.11 ± 2.60 Relative change in length of stay 1.18 0.97
Unruh[66] State Health Care Cost Containment Council; average length of stay in hospital. State Department of Health, American Hospital Association; total nurses FTE/1,000 APDC, RN FTE/ 1,000 APDC, LPN FTE/1,000 APDC	Hospitals 211 Unit Combined Patients Medical	Patient/RN % RNs 0.34 68.50 0.37 69.20 0.37 70.20 0.37 71.20 0.38 71.50 0.36 71.40 0.38 71.80	Length of stay, days 6.70 6.90 6.50 6.10 5.80 5.40 5.50
Zidek[85] Patient records and chart audits, individuals length of stay in the hospital, administrative records; total nursing hours/patient day; RN hours calculated from % of RN FTE/total FTE	Hospitals 1 Unit Combined Patients Medical	Nurse hours RN hours % RN 6.60 2.05 31.00 8.40 2.62 31.00 7.30 2.03 28.00 8.20 2.63 32.00 6.90 2.07 30.00 10.20 3.05 30.00 8.30 2.58 31.00 9.00 2.97 33.00 7.30 2.32 32.00 8.80 2.72 31.00 11.20 3.70 33.00 8.50 2.54 30.00	

APDC = Adjusted Patient Day Care; FTE = Full Time Equivalent; hrs = hours; ICU = Intensive Care Unit; LPN = Licensed Practical Nurse; LOS = Length of Stay; LVN = Licensed Vocational Nurse; MSW = Master of Social Work; NICU = Neonatal Intensive Care Unit; NIW = Nursing Intensity Weight; RN = Registered Nurse; SD = Standard Deviation

Table G10. Calculated change in hospital related mortality corresponding to an increase by 1 nursing hour/patient day (results from individual studies)

Author	Increase by 1 Nurse Hour		Increase by 1 RN Hour				Increase by 1 LPN Hour		Increase by 1 UAP Hour	
	Death rate	p value	Death rate	p value	RR	p value	Death rate	p value	Death rate	p value
Berney[84]					0.98	<0.05				
Blegen[59]		NS		NS						
Cho[38]		NS		NS						
Mark[90]					1.01	NS				
Mark[89]					0.94	NS				
Needleman[28]		NS		NS	1.00	NS		NS		NS
Needleman[29]		NS		NS	1.00	NS		NS		
Seago[34]					0.98	<0.05				
Thorson[55]					1.01	<0.05				

LPN = Licensed Practical Nurse; NS = Not Significant; RN = Registered Nurse; RR = Relative Risk; UAP = Unlicensed Assistive Personnel

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
ANA[65] HCFA and MEDPAR national data sets; Urinary tract infections, bacterial unspecified pneumonia, pressure ulcers, postoperative infections, vascular complications, anoxic brain damage; communicable conditions; complications in post-partum period; diabetic complications; joint effusion; metabolic imbalances, personal care complications; psychiatric secondary diagnosis; transfusion reactions; trauma in non-trauma patients RN % of licensed hours	Hospitals 1,384 Unit Combined Patients Combined	Increase by 1 hour in total nursing hours in New York, 1992 Increase by 1 hour in total nursing hours in New York, 1994 Increase by 1 hour in total nursing hours in California, 1992 Increase by 1 hour in total nursing hours in California, 1994 Increase by 1 hour in total nursing hours in New York, 1992 Increase by 1 hour in total nursing hours in New York, 1994 Increase by 1 hour in total nursing hours in California, 1992 Increase by 1 hour in total nursing hours in California, 1994	Relative Risk UTI Nosocomial infection NS NS NS NS NS NS NS NS Pneumonia Pressure ulcers 1.00 0.82 1.00 1.00 1.00 1.00 1.08 0.84
Archibald[57] Retrospective review of patient and microbiology records from December 1994 through December 1995. The total number of nosocomial infections caused by Serratia marcescens; number of infections per 1,000 patient days. Retrospective review of administrative records from December 1994 through December 1995 RN hours worked by the registered nursing staff of this unit; monthly nursing hours/patient day ratio	Hospitals 1 Unit ICU Patients Combined	Median RN hours/patient day,15.2 Increase by 1 hour in RNs/patient day, 16.2	Nosocomial Infection, rate/100 patient days 0.69 0.67

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Berney[84] The New York Statewide Planning and Research Cooperative System Actual number of events identified as secondary DRG: Death among patients with shock, sepsis, pneumonia, deep vein thrombosis/ pulmonary embolism, or gastrointestinal bleeding The New York State Institutional Cost Reports RN total hours in inpatient cost units/patients days in units adjusted for nursing acuity	Hospitals 161 Unit Medical Patients Medical Patients Surgical Patients Medical Patients Surgical Patients Medical Patients Medical Patients Medical	1 hour increase in RN hours/patient day 1 hour increase in RN hours/patient day 1 hour increase in RN hours/patient day 1 hour increase in RN hours/patient day 1 hour increase in RN hours/patient day 1 hour increase in RN hours/patient day 1 hour increase in RN hours/patient day	Relative risk Urinary tract infection 0.99 0.98 1.01 0.98 0.96 1.00 Gastro-intestinal bleeding - - - 0.95 0.92 0.99 Failure to rescue 0.98 0.97 0.99 0.98 0.97 0.99 Sepsis 0.96 0.94 0.98 0.97 0.95 0.99
Blegen[58] Comparative occurrence reporting service (CORS) The number of patient falls on the unit in quarter/1,000 patient days, the number of arrests on the unit in quarter/1,000 patient days Hospital reports (Institute for Quality Healthcare database) Hours of patient care for each unit provided by all personnel were added for each quarter and divided by patient days for that unit in that quarter	Hospitals 11 Unit Patients Combined Combined Combined Combined Neonatal Surgical ICU Surgical Combined Medical	Hours RN hours Mean of outcome in units 8.6 6.0 Increase by 1% in proportion of RN 1.1 Increase by 1 hour in total nursing care 1.0 Mean of outcome in units 5.7 2.1 Mean of outcome in units 11.3 9.9 Mean of outcome in units 18.0 16.2 Mean of outcome in units 10.8 7.8	Rate per 100 patient days Falls CPR 0.27 0.04 -0.05 -0.01 0.00 -0.01 0.40 0.03 0.04 0.00 0.14 0.58 0.22 0.16

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Blegen[73] Discharge databases of participating hospitals The number of patient falls on the unit in quarter/1,000patient days. Hospitals were members of the Institute for Quality Healthcare	Hospitals 11 Unit Combined Patients Combined	 Total hours -11, RN hours -7.8 Increase by 1% of RN hours/total nursing hours Increase by 1 nurse hour/patient day Increase by 1% of RN hours/total nursing hours Total hours -11, RN hours -7.7	Falls rate per 100 patient days 0.220 -0.028 -0.005 -0.019 0.270
Blegen[59] Hospital records; The number of patient complaints standardized as a rate per 1,000 patient days, new incidences of skin breakdown secondary to pressure or exposure to urine or feces, suddenly and involuntarily leaving a position and coming to rest on the floor or some object. All reported falls were included whether or not injuries resulted, nosocomial infections that express themselves in hospitalized patients in whom the infection was not present or incubating at the time of admission. A record of hours worked for each individual employee was completed by the staffing clerk and approved by the employee and nurse manager before being entered into the computerized payroll database The hours of care per patient day from all nursing	Hospitals 1 Unit Combined Patients Combined Acuity 4.19	 Increase by 1 hour in total nursing hours Total hours: 10.74, RN hours: 7.7 Increase by 1 hour in total nursing hours Total hours: 10.74, RN hours: 7.7	Rate per 100 patient days UTI Pneumonia Dec ulcer 0.03 0.34 0.26 Falls Nosocomial infection 0.01 0.05 0.27 0.60

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
personnel: hours of direct patient care by RNs, LPNs, and nursing assistants each month divided by the patient days of care on the unit for the month The hours of direct patient care from RNs divided by patient days excluding hours for non patient care (meetings, vacation, sick leave, and holidays)			
Bolton[26] California Nursing Outcomes Coalition database; the California Department of Health Services. Hospital-acquired pressure ulcers, unplanned descent to the floor in adult patients; the monthly fall rate per 1,000 patient days for each nursing unit and each hospital. Data are collected at the patient level and aggregated by CalNOC staff to the unit level. California Nursing Outcomes Coalition database; the California Department of Health Services Productive hours worked by the nursing staff who provide direct patient care on the defined unit RN hours/patient day % of UAP hours/total nursing hours	Medical-surgical units ICU	Hours / RN hours / LPN hours 8 / 4.7 / 0.88 16.8 / 15.3 / 1.51	Rate/100 patient days Falls / Pressure ulcer 3.70 / 8 0.10 / 13

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Cheung[32] Incidence reports, quality referrals, and medical record coding stores in the database Excalibur system Pressure ulcers, falls, primary bloodstream infections after admitting the unit as secondary diagnosis. Automated Nurse staffing Office system and direct observation of nursing activities with Hill_Rom COMposer@nurse locator system Total nursing personnel on the unit for each shift including the number of RN, LPN, aides, and unit secretaries RN hours/patient day LPN hours/patient day Aide hours/patient day	Hospitals 1 Unit Combined Patients Medical	Increase by 1 hour in total nursing hours Increase by 1 hour in total nursing hours Increase by 1 hour in total nursing hours	Relative risk Decubitus ulcer NS Falls NS Nosocomial Infections NS
Cho[30,38] The State Inpatient Databases ICD-9-CM for UTI, pressure ulcers, falls and injury, surgical wound infection, sepsis, adverse drug event. Hospital Financial Data The total productive hours worked by all nursing personnel per patient day; the total productive hours by registered nurses per patient day	Hospitals-232 Unit Combined Patients Combined Age 67.9 Race 79.3 Sex 48.9 Severity 49.7	RN hours/patient day Large, nonprofit, non-teaching, non-rural, 4 Large, nonprofit, non-teaching, non-rural ,5 Large, nonprofit, non-teaching, non-rural, 6 Large, nonprofit, non-teaching, non-rural, 8 Large, nonprofit, non-teaching, non-rural, 7 Medium, nonprofit, non-teaching, non-rural, 8 Medium, investor-owned, non-teaching, non-rural, 4 Medium, investor-owned, non-teaching, non-rural, 5 Medium, investor-owned, non-teaching, non-rural, 6 Medium, investor-owned, non-teaching, non-rural, 7 Medium, investor-owned, non-teaching, non-rural, 8 Medium, investor-owned, non-teaching, non-rural, 8 Large, nonprofit, teaching, non-rural, 5 Large, nonprofit, teaching, non-rural, 6	Pneumonia 2.06 1.88 1.72 1.43 1.57 1.33 2.09 1.91 1.74 1.59 1.45 2.16 1.98 1.81

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
		Large, nonprofit, teaching, non-rural, 8	1.51
		Medium, nonprofit, non-teaching, non-rural, 4	1.91
		Medium, nonprofit, non-teaching, non-rural, 5	1.75
		Medium, nonprofit, non-teaching, non-rural, 6	1.59
		Medium, nonprofit, non-teaching, non-rural, 7	1.45
		Large, nonprofit, teaching, non-rural, 4	2.17
		Large, nonprofit, teaching, non-rural, 7	1.65
		Total hours RN hours	UTI % SWI %
		Increase in 1 hour of total nurse hours	
		large nonprofit teaching hospitals 10 7.2	2.50 1.60
		Medium, nonprofit, non-teaching, non-rural 9 6	1.60 1.10
		Large, nonprofit, non-teaching, non-rural 9 6.6	2.00 1.50
		Medium, investor-owned non-teaching	
		non-rural hospitals 9 6.2	2.10 1.10
			Falls % Sepsis %
		Large nonprofit teaching hospitals 10 7.2	0.20 1.20
		Medium, nonprofit, non-teaching, non-rural 9 6	0.20 0.80
		Large, nonprofit, non-teaching, non-rural 9 6.6	0.20 1.10
		Medium, investor-owned non-teaching	
		non-rural hospitals 9 6.2	0 1.00
			Pneumonia Pressure ulcer
		Large nonprofit teaching hospitals 10 7.2	3.10 0.10
		Medium, nonprofit, non-teaching, non-rural 9 6	2.70 0.30
		Large, nonprofit, non-teaching, non-rural 9 6.6	2.80 0.30
		Medium, investor-owned non-teaching	
		non-rural hospitals 9 6.2	2.80 0.20
			Relative risk
			Urinary tract infection
		Increase in 1 hour of total nurse hours	1.02 0.95 1.08
		Increase in 1 hour of RN hours	1.01 0.93 1.08
			Pneumonia
		Increase in 1 hour of total nurse hours	0.96 0.91 1.01
		Increase in 1 hour of RN hours	0.91 0.85 0.97
			Falls
		Increase in 1 hour of total nurse hours	1.08 0.99 1.18
		Increase in 1 hour of RN hours	1.07 0.96 1.19
			Pulmonary Failure
		Increase in 1 hour of total nurse hours	1.13 1.01 1.27

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
		Increase in 1 hour of RN hours	1.11 0.97 1.27
			SWI
		Increase in 1 hour of total nurse hours	1.00 0.95 1.06
		Increase in 1 hour of RN hours	0.97 0.91 1.04
			Sepsis
		Increase in 1 hour of total nurse hours	1.01 0.95 1.08
		Increase in 1 hour of RN hours	1.02 0.95 1.09
Cimiotti[87] Patient discharges and medical records review by study's nurse epidemiologist Infections occurring in an infant 48 hours or longer after admission to the NICU including bloodstream infections, device associated pneumonia, CNS and skin infections, conjunctivitis; Nurse staffing office and sign-in/out sheet from each supplemental nursing agency; Total nursing hours worked by direct care providers adjusted for Nursing Intensity Weights categorized as below and above median RN hours/patient day adjusted for Nursing Intensity Weights categorized as below and above median	Hospitals 1 Unit Neonatal ICU Patients Medical	NICU A, 10.7 nursing hours/patient day NICU B, 11 nursing hours/patient day Mean staffing levels, 10.8 nursing hours/patient day Low nursing hours, 8.7/patient day High nursing hours,12.9/patient day Low RN hours, 8.5 hours/patient day High RN hours, 12.7 hours/patient day	Sepsis 10.50 5.50 1.00 2.56 1.38 3.71 1.74
			% Pneumonia Nosocomial infection
		NICU A, 10.7 nursing hours/patient day NICU B, 11 nursing hours/patient day	0.50 18.30 0.90 15.10
			Relative risk
			Nosocomial infection, relative risk
		Mean staffing levels, 10.8 nursing hours/patient day Low nursing hours, 8.7/patient day High nursing hours, 12.9/patient day Low RN hours, 8.5 hours/patient day High RN hours, 12.7 hours/patient day	1.00 1.25 0.84 1.75 1.08

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Donaldson[9] CalNOC database; Total number of patients with Stage I-IV pressure ulcers regardless of whether ulcer was acquired during hospitalization or present on admission;%/total number of surveyed patients, unplanned descent to the floor; rate/1,000 patient days. CalNOC database in 2004 and 2005 (after legislation); Productive hours worked by total nursing staff who have direct patient care responsibilities on the defined units and are included in the staffing matrix, total number of productive RN hours worked by all RNs (including contracted staff) with direct patient care responsibilities, total number of productive LPN hours worked by all LPNs (including contracted staff) with direct patient care responsibilities	Hospitals 68 Unit Combined Patients Medical	Medical surgical units, before mandatory ratios Hour RN hours licensed hours 8.08 4.76 5.44 Medical and surgical units after mandatory ratios Hour RN hours licensed hours 8.68 5.75 6.41 Step-down units before mandatory ratios Hour RN hours licensed hours 9.59 6.59 6.98 Step-down units after mandatory ratios Hour RN hours licensed hours 10.11 7.28 7.59 Medical surgical units before mandatory ratios Hour RN hours licensed hours 8.08 4.76 5.44 Medical and surgical units after mandatory ratios Hour RN hours licensed hours 8.68 5.75 6.41 Step-down units before mandatory ratios Hour RN hours licensed hours 9.59 6.59 6.98 Step-down units after mandatory ratios Hour RN hours licensed hours 10.11 7.28 7.59	Rate/100 patient days ± SD Falls 0.31 ± 0.20 0.32 ± 0.17 0.30 ± 0.22 0.26 ± 0.16 Pressure ulcers 14.07 ± 11.07 14.48 ± 10.39 13.52 ± 10.78 16.29 ± 10.27

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Donaldson[95] California Nursing Outcomes Coalition (CalNOC) Hospital acquired pressure related skin injury controlling for date of admission, % of all patients on the day of prevalence study Patient's unplanned descent to the hospital floor; were analyzed as 7 day aggregate per unit; also actual number per unit; the number of falls/1,000 patient days. The California Nursing Outcomes Coalition (CalNOC); hours worked by RNs, LPNs, and others (aides and other direct care providers) that have direct patient care responsibilities/ assignments on the defined unit and are included in the staffing matrix.	Hospitals 25 Unit Combined Patients Medical	Increase by 1 hour in total RN hours/patient day Increase by 1 hour in total licensed hours of care/patient day Increase by 1 hour in total nursing hours patient day	Rate/100 patient days ± SD -0.02 ± 0.05 -0.02 ± 0.05 -0.01 ± 0.07

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Fridkin[1] Medical records of the patients in surgical intensive care unit. Cases were defined as any patient hospitalized >48 hours, in the SICU >24 hours who developed a laboratory confirmed CVC-BSI during outbreak periods. Controls were randomly selected from all SICU patients; Laboratory confirmed catheter-associated bloodstream infections or clinical sepsis; rates were compared in pre- and outbreak periods. Hospital administrative records; RN hours/patient day	Hospitals 1 Unit ICU Patients Surgical	Pre-outbreak period, 20 RN hours/patient day Outbreak period, 17 RN hours/patient day RN hours Month's patient/nurse ratio = 1.2 20 Month's patient/nurse ratio = 1.5 16 Month's patient/nurse ratio = 2 12 Month's patient/nurse ratio = 1 24	Rate/100 patient days Nosocomial infection Sepsis 1.95 0.53 4.96 1.31 Relative risk 3.95 1.07 14.54 15.60 1.15 211.4 61.50 1.23 3,074 1.00 1.00 1.00

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Kovner[35] The National Inpatient Sample (NIS) Post operative discharges with urinary tract infection, pneumonia, pulmonary congestion, lung edema, or respiratory failure, and DVT in any secondary diagnosis. American Hospital Association Annual Survey of Hospitals, the part of the Health Care Utilization Project	Hospitals 5,708 Unit Surgical Patient Surgical	Increase by 1 hour in LPN hours/patient day Increase by 1 hour in LPN hours/patient day Increase by 1 hour in LPN hours/patient day Increase by 1 hour in LPN hours/patient day Year RN hours LPN hours 1990 5.84 1.24 1991 6.01 1.23 1992 5.9 1.13 1993 6.13 1.09 1994 6.13 1.01 1995 6.39 1.01 1996 6.56 0.97 1990 5.84 1.24 1991 6.01 1.23 1992 5.9 1.13 1993 6.13 1.09 1994 6.13 1.01 1995 6.39 1.01 1996 6.56 0.97	UTI, relative risk 1.01 Pneumonia, relative risk 0.99 Pulmonary failure, RR 1 Thrombosis, relative risk 0.96 Rate, % UTI Pneumonia 3.77 0.75 3.75 0.77 3.84 0.78 3.72 0.95 3.81 1.05 3.57 1.13 3.68 1.24 Pulmonary failure DVT 0.62 0.32 0.65 0.33 0.72 0.35 0.81 0.35 0.80 0.37 0.95 0.40 1.00 0.42

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Kovner[22] The Nationwide Inpatient Sample of hospital discharges; UTI, gastrointestinal hemorrhage or ulceration, pneumonia, invasive vascular procedure, pulmonary congestion, lung edema, respiratory insufficiency or failure, DVT or PE, AMI as secondary diagnoses after surgery. American Hospital Association data RN FTE working in the hospital and outpatient departments/adjusted patient day, LPN FTE working in the hospital and outpatient departments/ adjusted patient day.	Hospitals 589 Unit Surgical Patients Surgical	Reference 5.8 RN hours/adjusted patient day Increase by 0.5 RN hour/adjusted patient day Reference 5.8 RN hours/adjusted patient day Increase by 0.5 RN hour/adjusted patient day Reference 5.8 RN hours/adjusted patient day Increase by 0.5 RN hour/adjusted patient day Reference 5.8 RN hours/adjusted patient day Increase by 0.5 RN hour/adjusted patient day Increase by 1 LPN hour/patient day	Rate ± SD Urinary tract infection 3.58 ± 4.91 3.42 ± 4.91 Pneumonia 0.95 ± 1.91 0.91 ± 1.91 Pulmonary failure 0.82 ± 1.40 0.81 ± 1.40 Deep vein thrombosis 0.32 ± 0.59 0.31 ± 0.59 All outcomes NS
Langemo[41] The Midwest Research Institute/National Database of Nursing Quality Indicators; % of patients who had a pressure ulcer on a given day to all patients assessed for a pressure ulcer; pressure ulcers that occurred post admission were documented as hospital-acquired. The Midwest Research Institute/National Database of Nursing Quality Indicators; Total nursing hours/patient day	Hospital 1 Patients Medical Unit ICU	Medical-surgical units in hospitals with <100 bed Hours RN hours LPN hours 9.6 5 1.7 ICU in hospitals with 200-299 beds Hours RN hours LPN hours 18 17.6 0.1 ICU units in hospitals <100 beds Hours RN hours LPN hours 15 8.7 0.7 Medical-surgical units in hospitals with 200-299 beds Hours RN hours LPN hours 7.8 4.8 1.2	Pressure ulcers, rate,% 4.10 0.00 13.10 0.00

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Langemo[33] The North Dakota Nurses Association (NDNA) Research Council; Any lesion which is caused by unrelieved pressure that results in damage to underlying tissues; unplanned descent to the floor recorded in incidence reports. The North Dakota Nurses Association (NDNA) Research Council; Total number of productive hours worked by nursing staff with direct patient care responsibilities	Hospitals 6 Unit ICU Patients Medical Age 61.9 Sex 41	Acute care units 11 total nursing hours and 5.42 RN hours/patient day The authors compared the rate with published studies	Pressure ulcers, rate, % 8.60

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Lichtig[63] The Uniform Hospital Discharge Data Set; The California Office of Statewide Health Planning and Development; the Statewide Planning and Research Cooperative System Administratively Releasable file Urinary tract infection as the likely adverse patient outcomes of the hospital stay (secondary diagnosis), pneumonia as the likely adverse patient outcomes of the hospital stay (secondary diagnosis), pressure ulcers as the likely adverse patient outcomes of the hospital stay (secondary diagnosis), any secondary diagnosis of infection in surgical patients as the likely adverse patient outcomes of the hospital stay. The Annual Hospital Disclosure Report Institutional Cost Reports; Total RN hours per NIW-adjusted patient day	Unit Surgical Patients Surgical Hospitals 126 131 352 295	Increase by 1 hour in total nursing hours in New York, 1992 Increase by 1 hour in total nursing hours in New York, 1994 Increase by 1 hour in total nursing hours in California, 1992 Increase by 1 hour in total nursing hours in California, 1994	Relative risk, Urinary tract infection, pneumonia, surgical wound infections, and pressure ulcers NS NS NS NS Rate, % Pressure ulcer Pneumonia -17.89 -15.59 7.65

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Mark[89] The Healthcare Cost and Utilization Project (HCUP) National Inpatient Sample (NIS); Risk-adjusted observed/expected urinary tract infections, pneumonias, decubitus ulcers. American Hospital Association Annual Survey, Online Survey Certification and Reporting System [OSCAR]; RN hours/patient * day = (FTE RN/1,000patient * days * 37.5 * 48) / 1,000 LPN hours/patient * day = (FTE LPN/1,000 patient * days * 37.5 * 48) / 1,000	Hospitals 357 Unit Combined Patients Combined	Year RN hours LPN hours 1990 5.4 1.2 1992 5.8 1.2 1992 5.7 1.2 1993 6.0 1.1 1994 6.3 1.1 1995 6.5 1.1 1990 5.4 1.2 1992 5.8 1.2 1992 5.7 1.2 1993 6.0 1.1 1994 6.3 1.1 1995 6.5 1.1 1990 5.4 1.2 1992 5.8 1.2 1992 5.7 1.2 1993 6.0 1.1 1994 6.3 1.1 1995 6.5 1.1	Relative risk, 95% CI Urinary tract infection 1.18 1.13 1.23 1.17 1.11 1.23 1.17 1.12 1.22 1.14 1.08 1.20 1.11 1.05 1.17 0.98 0.93 1.03 Pneumonia 0.61 0.56 0.66 0.72 0.67 0.77 0.65 0.60 0.70 0.84 0.79 0.89 0.90 0.85 0.95 0.97 0.91 1.03 Decubitus ulcers 0.48 0.44 0.52 0.58 0.53 0.63 0.51 0.46 0.56 0.62 0.57 0.67 0.69 0.63 0.75 0.74 0.69 0.79
Needleman[28] 799 hospitals (11 states, all-patients + Medicare patients) – hospital level analysis; 256 California hospitals (part of the 11 state sample) – unit level analysis; National sample of 3,357 hospitals (Medicare patients) – hospital level analysis. Urinary tract infection coded in discharge abstract as secondary diagnosis, acute gastric ulcer, duodenal ulcer, peptic ulcer, gastrojejunal ulcer, hemorrhagic gastritis,	Hospitals Patients 32 Medical 280 Medical 83 Medical 128 Medical 68 Medical 86 Medical 145 Medical 154 Medical 25 Medical 127 Medical 488 Medical 3,357 Medical	Sample Hours RN hours LPN hours UAP hours Nevada 12.8 9.6 1.1 2.3 New York 11.3 7.2 1.2 2.8 Maryland 11.2 8.2 0.6 2.4 Virginia 12.2 8.6 1.9 1.9 West Virginia 11.8 7.1 2.2 2.9 South Carolina 11.7 7.7 2 2.2 Wisconsin 12.7 8.9 0.9 3 Missouri 12.7 8.9 0.9 2.9 Arizona 12.4 9.9 0.7 1.9 Massachusetts 10.9 7.6 0.8 2.3 California 10.7 7.5 1 2.2 Medicare, medical patients 10.6 7.8 1.7 Medicare, surgical patients	Rate % ± SD Urinary tract infection 4.92 ± 0.99 5.67 ± 1.87 6.10 ± 1.72 6.14 ± 1.88 5.85 ± 2.18 6.27 ± 2.30 5.89 ± 1.78 7.46 ± 2.28 4.99 ± 1.25 5.52 ± 1.76 6.92 ± 2.83 8.81 ± 3.01

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions		Nurse Staffing Categories					Patient Outcomes
erosive gastritis, unspecified	3,296	Surgical		10.6	7.8	1.7		7.75 ± 5.94
GI-hemorrhage, esophageal	127	Surgical	Massachusetts	10.9	7.6	0.8	2.3	3.31 ± 1.72
hemorrhage coded in	280	Surgical	New York	11.3	7.2	1.2	2.8	3.01 ± 1.31
discharge abstract as	83	Surgical	Maryland	11.2	8.2	0.6	2.4	2.87 ± 1.63
secondary diagnosis,	128	Surgical	Virginia	12.2	8.6	1.9	1.9	3.49 ± 2.28
aspiration pneumonia 507.0,	68	Surgical	West Virginia	11.8	7.1	2.2	2.9	6.95 ± 3.55
post-operative pneumonia	86	Surgical	South Carolina	11.7	7.7	2	2.2	3.62 ± 3.30
997.3, hypostatic pneumonia	145	Surgical	Wisconsin	12.7	8.9	0.9	3	2.73 ± 1.63
514, bacterial pneumonia	154	Surgical	Missouri	12.7	8.9	0.9	2.9	4.05 ± 2.33
482, bronchopneumonia 485,	25	Surgical	Arizona	12.4	9.9	0.7	1.9	2.89 ± 1.44
unspecified pneumonia 486	32	Surgical	Nevada	12.8	9	1.1	2.3	2.80 ± 0.84
coded in discharge abstract	488	Surgical	California	10.7	7.5	1	2.2	2.95 ± 1.72
as secondary diagnosis,								Gastrointestinal bleeding
cardiac arrest, shock without			Nevada	12.8	9.6	1.1	2.3	0.70 ± 0.34
mention of trauma, shock,			New York	11.3	7.2	1.2	2.8	1.05 ± 0.54
unspecified, cardiogenic			Maryland	11.2	8.2	0.6	2.4	1.22 ± 0.43
shock. shock, other,			Virginia	12.2	8.6	1.9	1.9	0.96 ± 0.41
respiratory arrest,			West Virginia	11.8	7.1	2.2	2.9	0.52 ± 0.26
nonmechanical methods of			South Carolina	11.7	7.7	2	2.2	0.89 ± 0.51
resuscitation,			Wisconsin	12.7	8.9	0.9	3	0.84 ± 0.44
cardiopulmonary			Missouri	12.7	8.9	0.9	2.9	1.21 ± 0.58
resuscitation, closed chest			Arizona	12.4	9.9	0.7	1.9	0.81 ± 0.41
massage, death in patients			Massachusetts	10.9	7.6	0.8	2.3	0.83 ± 0.41
with sepsis, pneumonia, GI			California	10.7	7.5	1	2.2	1.18 ± 0.81
bleeding, shock or DVT coded			Medicare, medical patients					
in discharge abstract as				10.6	7.8	1.7		1.53 ± 0.85
secondary diagnosis,			Medicare, surgical patients					
pressure ulcers coded with				10.6	7.8	1.7		1.37 ± 1.78
ICD 682 and 707.0 in			Massachusetts	10.9	7.6	0.8	2.3	0.35 ± 0.27
discharge abstract as			New York	11.3	7.2	1.2	2.8	0.49 ± 0.42
secondary diagnosis,			Maryland	11.2	8.2	0.6	2.4	0.58 ± 0.50
pulmonary congestion/			Virginia	12.2	8.6	1.9	1.9	0.38 ± 0.35
hypostasis, acute edema of			West Virginia	11.8	7.1	2.2	2.9	1.56 ± 1.09
lung, unspecified pulmonary			South Carolina	11.7	7.7	2	2.2	0.44 ± 0.63
insufficiency following trauma			Wisconsin	12.7	8.9	0.9	3	0.36 ± 0.25
and surgery, respiratory			Missouri	12.7	8.9	0.9	2.9	0.49 ± 0.50
failure, posttraumatic (958.3),			Arizona	12.4	9.9	0.7	1.9	0.32 ± 0.26
postoperative (998.5), V.			Nevada	12.8	9	1.1	2.3	0.59 ± 0.29

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories					Patient Outcomes
illiaca-451.81, V. fem-451.11, V. pop.-451.19, post-op PE-415.11, PE-415.1, DVT NEC-453.8 coded in discharge abstract as secondary diagnosis, cardiac arrest, shock without mention of trauma, shock, unspecified cardiogenic shock, shock, other respiratory arrest, nonmechanical methods of resuscitation, cardiopulmonary resuscitation, closed chest massage, CNS complications (coma and stupor, acute delirium, reactive confusion, reactive depression); physiologic/metabolic derangement		California	10.7	7.5	1	2.2	0.48 ± 0.40
							Pneumonia
		Nevada	12.8	9.6	1.1	2.3	2.61 ± 0.85
		New York	11.3	7.2	1.2	2.8	2.36 ± 0.94
		Maryland	11.2	8.2	0.6	2.4	2.38 ± 0.75
		Virginia	12.2	8.6	1.9	1.9	2.58 ± 1.04
		West Virginia	11.8	7.1	2.2	2.9	1.89 ± 0.84
		South Carolina	11.7	7.7	2	2.2	2.19 ± 0.99
		Wisconsin	12.7	8.9	0.9	3	1.89 ± 0.65
		Missouri	12.7	8.9	0.9	2.9	3.57 ± 1.56
		Arizona	12.4	9.9	0.7	1.9	2.01 ± 0.64
		Massachusetts	10.9	7.6	0.8	2.3	0.56 ± 0.40
		California	10.7	7.5	1	2.2	2.54 ± 0.98
		Medicare, medical patients					
			10.6	7.8	1.7		3.72 ± 1.79
		Medicare, surgical patients					
			10.6	7.8	1.7		3.42 ± 3.84
		Massachusetts	10.9	7.6	0.8	2.3	0.12 ± 0.16
		New York	11.3	7.2	1.2	2.8	0.98 ± 0.68
		Maryland	11.2	8.2	0.6	2.4	1.18 ± 0.91
		Virginia	12.2	8.6	1.9	1.9	1.32 ± 0.91
		West Virginia	11.8	7.1	2.2	2.9	5.35 ± 2.92
		South Carolina	11.7	7.7	2	2.2	2.00 ± 7.81
		Wisconsin	12.7	8.9	0.9	3	0.74 ± 0.54
		Missouri	12.7	8.9	0.9	2.9	1.56 ± 1.48
		Arizona	12.4	9.9	0.7	1.9	0.84 ± 0.52
		Nevada	12.8	9	1.1	2.3	1.68 ± 0.67
		California	10.7	7.5	1	2.2	1.00 ± 0.68
							Shock
		Nevada	12.8	9.6	1.1	2.3	0.59 ± 0.30
		New York	11.3	7.2	1.2	2.8	0.57 ± 0.32
		Maryland	11.2	8.2	0.6	2.4	0.56 ± 0.27
		Virginia	12.2	8.6	1.9	1.9	0.52 ± 0.42
		West Virginia	11.8	7.1	2.2	2.9	0.18 ± 0.16
		South Carolina	11.7	7.7	2	2.2	0.49 ± 0.30
		Wisconsin	12.7	8.9	0.9	3	0.41 ± 0.23
		Missouri	12.7	8.9	0.9	2.9	0.48 ± 0.31
		Arizona	12.4	9.9	0.7	1.9	0.55 ± 0.24

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories					Patient Outcomes
		Massachusetts	10.9	7.6	0.8	2.3	0.08 ± 0.08
		California	10.7	7.5	1	2.2	0.80 ± 1.32
		Medicare, medical patients					
			10.6	7.8	1.7		0.94 ± 0.72
		Medicare, surgical patients					
			10.6	7.8	1.7		1.23 ± 1.97
		Massachusetts	10.9	7.6	0.8	2.3	0.06 ± 0.09
		New York	11.3	7.2	1.2	2.8	0.39 ± 0.33
		Maryland	11.2	8.2	0.6	2.4	0.45 ± 0.40
		Virginia	12.2	8.6	1.9	1.9	0.35 ± 0.43
		West Virginia	11.8	7.1	2.2	2.9	1.56 ± 1.15
		South Carolina	11.7	7.7	2	2.2	0.27 ± 0.33
		Wisconsin	12.7	8.9	0.9	3	0.38 ± 0.62
		Missouri	12.7	8.9	0.9	2.9	0.50 ± 0.63
		Arizona	12.4	9.9	0.7	1.9	0.42 ± 0.34
		Nevada	12.8	9	1.1	2.3	0.83 ± 0.34
		California	10.7	7.5	1	2.2	0.59 ± 0.42
							Failure to rescue
		Nevada	12.8	9.6	1.1	2.3	18.68 ± 2.11
		New York	11.3	7.2	1.2	2.8	22.62 ± 5.92
		Maryland	11.2	8.2	0.6	2.4	18.83 ± 3.46
		Virginia	12.2	8.6	1.9	1.9	16.54 ± 5.42
		West Virginia	11.8	7.1	2.2	2.9	13.63 ± 6.21
		South Carolina	11.7	7.7	2	2.2	19.05 ± 6.10
		Wisconsin	12.7	8.9	0.9	3	16.15 ± 5.80
		Missouri	12.7	8.9	0.9	2.9	16.10 ± 5.28
		Arizona	12.4	9.9	0.7	1.9	16.76 ± 4.56
		Massachusetts	10.9	7.6	0.8	2.3	14.74 ± 4.59
		California	10.7	7.5	1	2.2	18.98 ± 5.37
		Medicare, medical patients					
			10.6	7.8	1.7		19.97 ± 7.57
		Medicare, surgical patients					
			10.6	7.8	1.7		22.75 ± 13.65
		Massachusetts	10.9	7.6	0.8	2.3	13.02 ± 19.01
		New York	11.3	7.2	1.2	2.8	20.88 ± 14.58
		Maryland	11.2	8.2	0.6	2.4	20.72 ± 12.24
		Virginia	12.2	8.6	1.9	1.9	19.51 ± 13.80
		West Virginia	11.8	7.1	2.2	2.9	22.48 ± 12.19

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories					Patient Outcomes
		South Carolina	11.7	7.7	2	2.2	16.59 ± 12.53
		Wisconsin	12.7	8.9	0.9	3	13.00 ± 10.24
		Missouri	12.7	8.9	0.9	2.9	17.36 ± 11.19
		Arizona	12.4	9.9	0.7	1.9	18.39 ± 9.31
		Nevada	12.8	9	1.1	2.3	21.58 ± 9.25
		California	10.7	7.5	1	2.2	22.57 ± 11.85
							Decubitus ulcer
		Nevada	12.8	9.6	1.1	2.3	6.31 ± 3.80
		New York	11.3	7.2	1.2	2.8	7.52 ± 4.13
		Maryland	11.2	8.2	0.6	2.4	9.01 ± 3.62
		Virginia	12.2	8.6	1.9	1.9	6.61 ± 2.58
		West Virginia	11.8	7.1	2.2	2.9	5.22 ± 2.90
		South Carolina	11.7	7.7	2	2.2	6.57 ± 4.44
		Wisconsin	12.7	8.9	0.9	3	4.57 ± 2.86
		Missouri	12.7	8.9	0.9	2.9	6.37 ± 2.94
		Arizona	12.4	9.9	0.7	1.9	4.43 ± 2.56
		Massachusetts	10.9	7.6	0.8	2.3	3.08 ± 1.63
		California	10.7	7.5	1	2.2	9.20 ± 5.21
		Medicare, surgical patients					Pulmonary failure
			10.6	7.8	1.7		3.53 ± 3.20
		Massachusetts	10.9	7.6	0.8	2.3	0.18 ± 0.23
		New York	11.3	7.2	1.2	2.8	1.09 ± 0.82
		Maryland	11.2	8.2	0.6	2.4	1.57 ± 1.15
		Virginia	12.2	8.6	1.9	1.9	1.17 ± 0.95
		West Virginia	11.8	7.1	2.2	2.9	2.19 ± 2.09
		South Carolina	11.7	7.7	2	2.2	2.04 ± 7.81
		Wisconsin	12.7	8.9	0.9	3	0.72 ± 0.51
		Missouri	12.7	8.9	0.9	2.9	1.23 ± 0.85
		Arizona	12.4	9.9	0.7	1.9	1.09 ± 0.62
		Nevada	12.8	9	1.1	2.3	3.90 ± 1.44
		California	10.7	7.5	1	2.2	1.24 ± 0.84
							Pressure ulcers
		Nevada	12.8	9.6	1.1	2.3	6.31 ± 3.80
		New York	11.3	7.2	1.2	2.8	7.52 ± 4.13
		Maryland	11.2	8.2	0.6	2.4	9.01 ± 3.62
		Virginia	12.2	8.6	1.9	1.9	6.61 ± 2.58
		West Virginia	11.8	7.1	2.2	2.9	5.22 ± 2.90
		South Carolina	11.7	7.7	2	2.2	6.57 ± 4.44

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories					Patient Outcomes
		Wisconsin	12.7	8.9	0.9	3	4.75 ± 2.86
		Missouri	12.7	8.9	0.9	2.9	6.37 ± 2.94
		Arizona	12.4	9.9	0.7	1.9	4.43 ± 2.56
		Massachusetts	10.9	7.6	0.8	2.3	3.08 ± 1.63
		California	10.7	7.5	1	2.2	9.20 ± 5.21
		Medicare, medical patients					
			10.6	7.8	1.7		6.78 ± 5.34
		Medicare, surgical patients					
			10.6	7.8	1.7		8.13 ± 8.31
		Massachusetts	10.9	7.6	0.8	2.3	2.99 ± 4.10
		New York	11.3	7.2	1.2	2.8	6.55 ± 5.01
		Maryland	11.2	8.2	0.6	2.4	7.07 ± 6.35
		Virginia	12.2	8.6	1.9	1.9	6.47 ± 9.22
		West Virginia	11.8	7.1	2.2	2.9	6.97 ± 6.19
		South Carolina	11.7	7.7	2	2.2	4.63 ± 4.31
		Wisconsin	12.7	8.9	0.9	3	2.87 ± 3.18
		Missouri	12.7	8.9	0.9	2.9	3.89 ± 4.87
		Arizona	12.4	9.9	0.7	1.9	4.11 ± 3.25
		Nevada	12.8	9	1.1	2.3	6.24 ± 6.06
		California	10.7	7.5	1	2.2	6.93 ± 7.98
							Deep vein thrombosis, pulmonary embolism
		Nevada	12.8	9.6	1.1	2.3	0.57 ± 0.31
		New York	11.3	7.2	1.2	2.8	0.48 ± 0.24
		Maryland	11.2	8.2	0.6	2.4	0.59 ± 0.34
		Virginia	12.2	8.6	1.9	1.9	0.50 ± 0.22
		West Virginia	11.8	7.1	2.2	2.9	0.43 ± 0.23
		South Carolina	11.7	7.7	2	2.2	0.40 ± 0.17
		Wisconsin	12.7	8.9	0.9	3	0.52 ± 0.39
		Missouri	12.7	8.9	0.9	2.9	0.64 ± 0.44
		Arizona	12.4	9.9	0.7	1.9	0.45 ± 0.19
		Massachusetts	10.9	7.6	0.8	2.3	0.34 ± 0.19
		California	10.7	7.5	1	2.2	0.51 ± 0.32
		Medicare, medical patients					
			10.6	7.8	1.7		0.68 ± 0.47
		Medicare, surgical patients					
			10.6	7.8	1.7		0.85 ± 1.10
		Massachusetts	10.9	7.6	0.8	2.3	0.19 ± 0.20

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories					Patient Outcomes
		New York	11.3	7.2	1.2	2.8	0.44 ± 0.30
		Maryland	11.2	8.2	0.6	2.4	0.49 ± 0.39
		Virginia	12.2	8.6	1.9	1.9	0.36 ± 0.37
		West Virginia	11.8	7.1	2.2	2.9	0.77 ± 0.86
		South Carolina	11.7	7.7	2	2.2	0.36 ± 0.30
		Wisconsin	12.7	8.9	0.9	3	0.46 ± 0.47
		Missouri	12.7	8.9	0.9	2.9	0.41 ± 0.36
		Arizona	12.4	9.9	0.7	1.9	0.27 ± 0.24
		Nevada	12.8	9	1.1	2.3	0.77 ± 0.42
		California	10.7	7.5	1	2.2	0.35 ± 0.39
							Surgical wounds infection
		Medicare, surgical patients					
			10.6	7.8	1.7		1.09 ± 1.30
		Massachusetts	10.9	7.6	0.8	2.3	0.85 ± 0.46
		New York	11.3	7.2	1.2	2.8	0.91 ± 0.58
		Maryland	11.2	8.2	0.6	2.4	0.91 ± 0.52
		Virginia	12.2	8.6	1.9	1.9	0.70 ± 0.53
		West Virginia	11.8	7.1	2.2	2.9	0.38 ± 0.52
		South Carolina	11.7	7.7	2	2.2	0.69 ± 0.52
		Wisconsin	12.7	8.9	0.9	3	0.73 ± 0.45
		Missouri	12.7	8.9	0.9	2.9	0.67 ± 0.56
		Arizona	12.4	9.9	0.7	1.9	0.72 ± 0.39
		Nevada	12.8	9	1.1	2.3	0.85 ± 0.40
		California	10.7	7.5	1	2.2	0.83 ± 0.58
							Sepsis
		Nevada	12.8	9.6	1.1	2.3	1.47 ± 0.49
		New York	11.3	7.2	1.2	2.8	1.30 ± 0.56
		Maryland	11.2	8.2	0.6	2.4	1.53 ± 0.63
		Virginia	12.2	8.6	1.9	1.9	1.04 ± 0.78
		West Virginia	11.8	7.1	2.2	2.9	0.49 ± 0.35
		South Carolina	11.7	7.7	2	2.2	1.12 ± 0.54
		Wisconsin	12.7	8.9	0.9	3	1.00 ± 0.73
		Missouri	12.7	8.9	0.9	2.9	1.10 ± 0.60
		Arizona	12.4	9.9	0.7	1.9	1.58 ± 0.78
		Massachusetts	10.9	7.6	0.8	2.3	0.35 ± 0.19
		California	10.7	7.5	1	2.2	1.71 ± 1.04
		Medicare, medical patients					
			10.6	7.8	1.7		1.33 ± 0.98

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories				Patient Outcomes		
		Medicare, surgical patients						
			10.6	7.8	1.7	2.37 ± 2.35		
		Massachusetts	10.9	7.6	0.8	2.3	0.15 ± 0.23	
		New York	11.3	7.2	1.2	2.8	1.06 ± 0.80	
		Maryland	11.2	8.2	0.6	2.4	1.35 ± 0.85	
		Virginia	12.2	8.6	1.9	1.9	0.91 ± 0.98	
		West Virginia	11.8	7.1	2.2	2.9	1.30 ± 1.07	
		South Carolina	11.7	7.7	2	2.2	0.79 ± 0.62	
		Wisconsin	12.7	8.9	0.9	3	0.65 ± 0.47	
		Missouri	12.7	8.9	0.9	2.9	0.85 ± 0.83	
		Arizona	12.4	9.9	0.7	1.9	0.94 ± 0.60	
		Nevada	12.8	9	1.1	2.3	1.84 ± 0.80	
		California	10.7	7.5	1	2.2	1.19 ± 0.82	
							Relative risk, 95% CI	
		Increase by 1 hour of RN hours in medical patients					0.99	0.98 0.99
		Increase by 1 hour in RN hours in surgical patients					1.00	0.98 1.02
		Increase by 1 hour in LPN hours in medical patients					1.06	1.04 1.09
		Increase by 1 hour in LPN hours in surgical patients					1.04	1.01 1.08
		Increase by 1 hour in UAP hours in medical patients					1.00	0.98 1.01
		Increase by 1 hour in UAP hours in surgical patients					1.00	0.98 1.02
		Increase by 1 hour in total nursing hours in medical patients					1.00	1.00 1.01
		Increase by 1 hour in total nursing hours in surgical patients					1.01	1.00 1.02
		Increase by 1 hour in licensed hours/patient-day in medical patients					1.00	0.99 1.01
		increase by 1% of RN hours/total licensed hours per patient day in medical patients					0.48	0.38 0.61
		Increase by 1 hour in licensed hours/patient-day in surgical patients					1.01	0.99 1.02
		Increase by 1 hour in RN hours in medical patients					0.99	0.99 1.00
		Increase by 1 hour in LPN hours in medical patients					1.01	1.00 1.02
		Increase by 1 hour in licensed hours in medical patients					1.00	0.99 1.00
		Increase in total nurse hours in medical patients					1.00	0.99 1.01
		Increase by 1 hour in UAP hours in medical patients					0.99	0.98 1.01
		Increase by 1 hour in RN hours in surgical patients					0.99	0.98 1.00
		Increase by 1 hour in LPN in surgical patients					1.00	0.99 1.01
		Increase by 1 hour in licensed hours in surgical patients					0.99	0.99 1.00
		Increase by 1 hour in UAP hours in surgical patients					1.00	0.98 1.02
		Increase by 1 hour in total nursing hours					1.00	0.99 1.02
		Increase by 1 hour in RN hours in medical patients, hospital level analysis, California hospitals					0.99	0.97 1.00

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes		
		Increase by 1 hour in LPN hours in medical patients, hospital level analysis, California hospitals	1.10	1.03	1.17
		Increase by 1 hour in UAP hours in medical patients, hospital level analysis, California hospitals	1.00	0.97	1.03
		Increase by 1 hour in total nursing hours in medical patients, hospital level analysis, California hospitals	1.00	0.98	1.01
		Increase by 1 hour of licensed nursing hours in medical patients, hospital level analysis, California hospitals	1.00	0.99	1.02
		Increase by 1 hour of RN hours in medical patients, unit level analysis, California hospitals	0.98	0.96	1.00
		Increase by 1 hour in LPN hours in medical patients, unit level analysis, California hospitals	1.05	0.99	1.12
		Increase by 1 hour in UAP hours/patient-day in medical patients, unit level analysis, California hospitals	0.99	0.95	1.02
		Increase by 1 hour in total nursing hours in medical patients, unit level analysis, California hospitals.	0.99	0.97	1.01
		Increase by 1 hour of total licensed hours in medical patients, unit level analysis, California hospitals	0.99	0.97	1.01
		Increase by 1 hour of RN hours in surgical patients, hospital level analysis, California hospitals	0.87	0.77	0.99
		Increase by 1 hour in LPN hours in surgical patients, hospital level analysis, California hospitals	1.02	0.93	1.11
		Increase by 1 hour in UAP hours in surgical patients, hospital level analysis, California hospitals	1.00	0.95	1.05
		Increase by 1 hour in total nursing hours in surgical patients, hospital level analysis, California hospitals	1.00	0.98	1.03
		Increase by 1 hour in licensed hours in surgical patients, hospital level analysis, California hospitals	0.89	0.80	0.99
		Increase by 1% in RN hours/licensed hours in surgical patients, hospital level analysis, California hospitals	0.64	0.30	1.37
		Increase by 1 hour of RN hours in surgical patients, unit level analysis, California hospitals	0.77	0.59	0.99
		Increase by 1 hour in LPN hours in surgical patients, unit level analysis, California hospitals	1.03	0.94	1.13
		Increase by 1 hour in UAP hours in surgical patients, unit level analysis, California hospitals	1.01	0.95	1.08
		Increase by 1 hour in total nursing hours in surgical patients, unit level analysis, California hospitals	0.81	0.66	0.98

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes		
		Increase by 1 hour in licensed hours in surgical patients, unit level analysis, California hospitals	0.70	0.48	1.04
		1% increase in RN hours/total licensed hours (RN + LPN)	0.49	0.37	0.61
		Increase by 1 licensed hour (RN + LPN)/patient day	1.01	0.99	1.02
		Increase by 1 licensed hour (RN + LPN)/patient day	0.99	0.99	1.00
		Increase by 1 licensed hour (RN + LPN)/patient day	1.00	0.99	1.02
		Increase by 1 licensed hour (RN + LPN)/patient day	1.00	0.99	1.00
		Increase by 1 licensed hour (RN + LPN)/patient day	1.00	0.99	1.01
		Increase by 1 licensed hour (RN + LPN)/patient day	1.00	0.99	1.01
		Increase by 1 hour of RN in surgical patients	1.00	0.98	1.02
		Increase by 1 hour of RN in medical patients	0.99	0.98	1.00
			Gastrointestinal bleeding		
		Increase by 1 hour of RN hours in medical patients	0.98	0.97	0.99
		Increase by 1 hour in RN hours in surgical patients	0.98	0.96	1.01
		Increase by 1 hour in LPN hours in medical patients	1.02	0.98	1.06
		Increase by 1 hour in LPN hours in surgical patients	1.03	0.96	1.10
		Increase by 1 hour in UAP hours in medical patients	1.00	0.98	1.02
		Increase by 1 hour in UAP hours in surgical patients	1.00	0.97	1.04
		Increase by 1 hour in total nursing hours in medical patients	0.99	0.98	1.01
		Increase by 1 hour in total nursing hours in surgical patients	0.99	0.97	1.01
		Increase by 1 hour in licensed hours/patient-day in medical patients	0.99	0.97	1.00
		increase by 1% of RN hours/total licensed hours per patient day in medical patients	0.66	0.45	0.96
		Increase by 1 hour in licensed hours/patient day in surgical patients	0.99	0.96	1.01
		Increase by 1 hour in RN hours in medical patients	0.99	0.99	1.00
		Increase by 1 hour in LPN hours in medical patients	0.99	0.98	1.01
		Increase by 1 hour in licensed hours in medical patients	0.99	0.99	1.00
		Increase in total nurse hours in medical patients	0.99	0.97	1.00
		Increase by 1 hour in UAP hours in medical patients	1.00	0.97	1.02
		Increase by 1 hour in RN hours in surgical patients	0.98	0.98	0.99
		Increase by 1 hour in LPN in surgical patients	1.00	0.98	1.02
		Increase by 1 hour in licensed hours in surgical patients	0.99	0.98	0.99
		Increase by 1 hour in UAP hours in surgical patients	1.00	0.95	1.04
		Increase by 1 hour in total nursing hours	0.99	0.97	1.02
		Increase by 1 hour in RN hours in medical patients, hospital level analysis, California hospitals	0.98	0.96	1.00
		Increase by 1 hour in LPN hours in medical patients, hospital level analysis, California hospitals	1.02	0.93	1.11

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes		
		Increase by 1 hour in UAP hours in medical patients, hospital level analysis, California hospitals	0.99	0.95	1.04
		Increase by 1 hour in total nursing hours in medical patients, hospital level analysis, California hospitals	0.99	0.97	1.01
		Increase by 1 hour of licensed nursing hours in medical patients, hospital level analysis, California hospitals	0.98	0.96	1.01
		Increase by 1hour of RN hours in medical patients, unit level analysis, California hospitals	0.98	0.95	1.01
		Increase by 1 hour in LPN hours in medical patients, unit level analysis, California hospitals	1.01	0.92	1.10
		Increase by 1 hour in UAP hours/patient-day in medical patients, unit level analysis, California hospitals	0.99	0.93	1.04
		Increase by 1 hour in total nursing hours in medical patients, unit level analysis, California hospitals.	0.99	0.96	1.01
		Increase by 1 hour of total licensed hours in medical patients, unit level analysis, California hospitals	0.98	0.95	1.02
		Increase by 1 hour of RN hours in surgical patients, hospital level analysis, California hospitals	1.01	0.98	1.05
		Increase by 1 hour in LPN hours in surgical patients, hospital level analysis, California hospitals	1.05	0.91	1.20
		Increase by 1 hour in UAP hours in surgical patients, hospital level analysis, California hospitals	1.00	0.93	1.08
		Increase by 1 hour in total nursing hours in surgical patients, hospital level analysis, California hospitals	0.85	0.67	1.09
		Increase by 1 hour in licensed hours in surgical patients, hospital level analysis, California hospitals	1.02	0.98	1.06
		Increase by 1% in RN hours/licensed hours in surgical patients, hospital level analysis, California hospitals	0.72	0.22	2.37
		Increase by 1 hour of RN hours in surgical patients, unit level analysis, California hospitals	1.03	0.98	1.08
		Increase by 1 hour in LPN hours in surgical patients, unit level analysis, California hospitals	1.09	0.94	1.26
		Increase by 1 hour in UAP hours in surgical patients, unit level analysis, California hospitals	0.96	0.88	1.06
		Increase by 1 hour in total nursing hours in surgical patients, unit level analysis, California hospitals	0.74	0.57	0.96
		Increase by 1 hour in licensed hours in surgical patients, unit level analysis, California hospitals	1.04	0.99	1.09

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes		
		1% increase in RN hours/total licensed hours (RN + LPN)	0.66	0.41	0.90
		Increase by 1 licensed hour (RN + LPN)/patient day	0.99	0.96	1.01
		Increase by 1 licensed hour (RN + LPN)/patient day	0.99	0.98	0.99
		Increase by 1 licensed hour (RN + LPN)/patient day	0.99	0.96	1.02
		Increase by 1 licensed hour (RN + LPN)/patient day	0.99	0.99	1.00
		Increase by 1 licensed hour (RN + LPN)/patient day	0.99	0.97	1.00
		Increase by 1 licensed hour (RN + LPN)/patient day	0.99	0.97	1.00
		Increase by 1 hour of RN in medical patients	0.98	0.97	0.99
			Pneumonia		
		Increase by 1 hour of RN hours in medical patients	0.99	0.98	1.00
		Increase by 1 hour in RN hours in surgical patients	1.00	0.98	1.03
		Increase by 1 hour in LPN hours in medical patients	1.05	1.01	1.08
		Increase by 1 hour in LPN hours in surgical patients	1.07	1.01	1.14
		Increase by 1 hour in UAP hours in medical patients	1.00	0.99	1.02
		Increase by 1 hour in UAP hours in surgical patients	1.00	0.97	1.04
		Increase by 1 hour in total nursing hours in medical patients	1.00	0.99	1.01
		Increase by 1 hour in total nursing hours in surgical patients	1.02	1.00	1.05
		Increase by 1 hour in licensed hours/patient-day in medical patients	1.00	0.99	1.01
		increase by 1% of RN hours/total licensed hours per patient day in medical patients	0.59	0.44	0.80
		Increase by 1 hour in licensed hours/patient day in surgical patients	1.02	0.99	1.04
		Increase by 1 hour in RN hours in medical patients	1.00	0.99	1.00
		Increase by 1 hour in LPN hours in medical patients	1.01	1.00	1.02
		Increase by 1 hour in licensed hours in medical patients	1.00	0.99	1.00
		Increase in total nurse hours in medical patients	1.10	1.01	1.19
		Increase by 1 hour in UAP hours in medical patients	1.00	1.10	0.91
		Increase by 1 hour in RN hours in surgical patients	0.99	0.98	1.00
		Increase by 1 hour in LPN in surgical patients	0.99	0.98	1.01
		Increase by 1 hour in licensed hours in surgical patients	0.99	0.98	1.00
		Increase by 1 hour in UAP hours in surgical patients	1.01	0.97	1.05
		Increase by 1 hour in total nursing hours	1.03	1.00	1.05
		Increase by 1 hour in RN hours in medical patients, hospital level analysis, California hospitals	0.99	0.97	1.01
		Increase by 1 hour in LPN hours in medical patients, hospital level analysis, California hospitals	1.08	1.01	1.15
		Increase by 1 hour in UAP hours in medical patients, hospital level analysis, California hospitals	0.99	0.96	1.02
		Increase by 1 hour in total nursing hours in medical patients,	1.00	0.99	1.01

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes		
		hospital level analysis, California hospitals			
		Increase by 1 hour of licensed nursing hours in medical patients, hospital level analysis, California hospitals	1.00	0.99	1.02
		Increase by 1 hour of RN hours in medical patients, unit level analysis, California hospitals	0.98	0.96	1.00
		Increase by1 hour in LPN hours in medical patients, unit level analysis, California hospitals	1.04	0.97	1.10
		Increase by 1 hour in UAP hours/patient day in medical patients, unit level analysis, California hospitals	0.98	0.95	1.02
		Increase by 1 hour in total nursing hours in medical patients, unit level analysis, California hospitals.	0.99	0.97	1.01
		Increase by 1 hour of total licensed hours in medical patients, unit level analysis, California hospitals	0.99	0.97	1.01
		Increase by 1 hour of RN hours in surgical patients, hospital level analysis, California hospitals	1.02	0.99	1.04
		Increase by 1 hour in LPN hours in surgical patients, hospital level analysis, California hospitals	1.06	0.95	1.19
		Increase by 1 hour in UAP hours in surgical patients, hospital level analysis, California hospitals	1.07	1.01	1.14
		Increase by 1 hour in total nursing hours in surgical patients, hospital level analysis, California hospitals	1.03	1.01	1.06
		Increase by 1 hour in licensed hours in surgical patients, hospital level analysis, California hospitals	1.02	0.99	1.05
		Increase by 1% in RN hours/licensed hours in surgical patients, hospital level analysis, California hospitals	0.66	0.26	1.69
		Increase by 1 hour of RN hours in surgical patients, unit level analysis, California hospitals	1.02	0.98	1.07
		Increase by 1 hour in LPN hours in surgical patients, unit level analysis, California hospitals	1.06	0.95	1.19
		Increase by 1 hour in UAP hours in surgical patients, unit level analysis, California hospitals	1.06	0.98	1.14
		Increase by 1 hour in total nursing hours in surgical patients, unit level analysis, California hospitals	1.03	0.99	1.08
		Increase by 1 hour in licensed hours in surgical patients, unit level analysis, California hospitals	1.03	0.99	1.07
		1% increase in RN hours/total licensed hours (RN + LPN)	0.61	0.42	0.79
		Increase by 1 licensed hour (RN + LPN)/patient day	1.02	0.99	1.04
		Increase by 1 licensed hour (RN + LPN)/patient day	0.99	0.98	0.99

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes		
		Increase by 1 licensed hour (RN + LPN)/patient day	1.02	0.99	1.04
		Increase by 1 licensed hour (RN + LPN)/patient day	1.00	0.99	1.00
		Increase by 1 licensed hour (RN + LPN)/patient day	1.00	0.99	1.01
		Increase by 1 licensed hour (RN + LPN)/patient day	1.00	0.99	1.01
		Increase by 1 hour of RN in medical patients	0.99	0.98	1.00
			Shock		
		Increase by 1 hour of RN hours in medical patients	0.98	0.96	1.00
		Increase by 1 hour in RN hours in surgical patients	0.99	0.96	1.02
		Increase by 1 hour in LPN hours in medical patients	1.07	1.01	1.12
		Increase by 1 hour in LPN hours in surgical patients	1.04	0.98	1.11
		Increase by 1 hour in UAP hours in medical patients	1.02	0.98	1.05
		Increase by 1 hour in UAP hours in surgical patients	0.98	0.94	1.03
		Increase by 1 hour in total nursing hours in medical patients	0.84	0.71	0.99
		Increase by 1 hour in total nursing hours in surgical patients	0.99	0.97	1.01
		Increase by 1 hour in licensed hours/patient-day in medical patients	1.00	0.97	1.02
		Increase by 1% of RN hours/total licensed hours per patient day in medical patients	0.46	0.27	0.81
		Increase by 1 hour in licensed hours/patient day in surgical patients	1.00	0.97	1.02
		Increase by 1 hour in RN hours in medical patients	0.99	0.98	1.00
		Increase by 1 hour in LPN hours in medical patients	1.03	1.01	1.05
		Increase by 1 hour in licensed hours in medical patients	1.00	0.99	1.01
		Increase in total nurse hours in medical patients	1.00	0.99	1.02
		Increase by 1 hour in UAP hours in medical patients	1.03	0.99	1.06
		Increase by 1 hour in RN hours in surgical patients	0.99	0.98	1.00
		Increase by 1 hour in LPN in surgical patients	1.03	1.01	1.04
		Increase by 1 hour in licensed hours in surgical patients	1.00	0.99	1.00
		Increase by 1 hour in UAP hours in surgical patients	1.01	0.96	1.06
		Increase by 1 hour in total nursing hours	1.00	0.98	1.03
		Increase by 1 hour in RN hours in medical patients, hospital level analysis, California hospitals	0.97	0.94	1.00
		Increase by 1 hour in LPN hours in medical patients, hospital level analysis, California hospitals	1.17	1.04	1.31
		Increase by 1 hour in UAP hours in medical patients, hospital level analysis, California hospitals	1.08	1.01	1.16
		Increase by 1 hour in total nursing hours in medical patients, hospital level analysis, California hospitals	1.02	0.99	1.04
		Increase by 1 hour of licensed nursing hours in medical patients, hospital level analysis, California hospitals	1.00	0.97	1.03

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes		
		Increase by 1 hour of RN hour in medical patients, unit level analysis, California hospitals	0.97	0.92	1.01
		Increase by 1 hour in LPN hours in medical patients, unit level analysis, California hospitals	1.08	0.95	1.21
		Increase by 1 hour in UAP hours/patient day in medical patients, unit level analysis, California hospitals	1.08	1.00	1.17
		Increase by 1 hour in total nursing hours in medical patients, unit level analysis, California hospitals.	1.01	0.97	1.05
		Increase by 1 hour of total licensed hours in medical patients, unit level analysis, California hospitals	0.99	0.27	3.62
		Increase by 1 hour of RN hours in surgical patients, hospital level analysis, California hospitals	0.97	0.94	1.00
		Increase by 1 hour in LPN hours in surgical patients, hospital level analysis, California hospitals	1.18	1.06	1.32
		Increase by 1 hour in UAP hours in surgical patients, hospital level analysis, California hospitals	1.01	0.94	1.08
		Increase by 1 hour in total nursing hours in surgical patients, hospital level analysis, California hospitals	1.00	0.97	1.03
		Increase by 1 hour in licensed hours in surgical patients, hospital level analysis, California hospitals	0.99	0.96	1.03
		Increase by 1% in RN hours/licensed hours in surgical patients, hospital level analysis, California hospitals	0.22	0.09	0.57
		Increase by 1 hour of RN hours in surgical patients, unit level analysis, California hospitals	1.55	1.12	2.15
		Increase by 1 hour in LPN hours in surgical patients, unit level analysis, California hospitals	1.21	1.07	1.36
		Increase by 1 hour in UAP hours in surgical patients, unit level analysis, California hospitals	1.94	1.11	3.40
		Increase by 1 hour in total nursing hours in surgical patients, unit level analysis, California hospitals	1.01	0.97	1.06
		Increase by 1 hour in licensed hours in surgical patients, unit level analysis, California hospitals	1.68	1.05	2.69
		1% increase in RN hours/total licensed hours (RN + LPN)	0.49	0.21	0.77
		Increase by 1 licensed hour (RN + LPN)/patient day	1.00	0.97	1.02
		Increase by 1 licensed hour (RN + LPN)/patient day	1.00	0.99	1.00
		Increase by 1 licensed hour (RN + LPN)/patient day	1.00	0.97	1.03
		Increase by 1 licensed hour (RN + LPN)/patient day	1.00	0.99	1.01
		Increase by 1 licensed hour (RN + LPN)/patient day	1.00	0.97	1.02

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
		Increase by 1 licensed hour (RN +LPN)/patient day	1.00 0.97 1.02
		Increase by 1 hour of RN in medical patients	0.98 0.96 1.01
			Failure to rescue
		Increase by 1 hour of RN hours in medical patients	1.00 0.99 1.01
		Increase by 1 hour in RN hours in surgical patients	0.98 0.96 0.99
		Increase by 1 hour in LPN hours in medical patients	1.02 1.00 1.04
		Increase by 1 hour in LPN hours in surgical patients	1.01 0.97 1.06
		Increase by 1 hour in UAP hours in medical patients	1.01 1.00 1.03
		Increase by 1 hour in UAP hours in surgical patients	1.02 0.99 1.04
		Increase by 1 hour in total nursing hours in medical patients	1.01 1.00 1.01
		Increase by 1 hour in total nursing hours in surgical patients	0.99 0.98 1.01
		Increase by 1 hour in licensed hours/patient-day in medical patients	1.00 0.99 1.01
		Increase by 1% of RN hours/total licensed hours per patient day in medical patients	0.81 0.66 1.00
		Increase by 1 hour in licensed hours/patient day in surgical patients	0.98 0.97 1.00
		Increase by 1 hour in RN hours in medical patients	1.00 0.99 1.00
		Increase by 1 hour in LPN hours in medical patients	1.01 1.00 1.01
		Increase by 1 hour in licensed hours in medical patients	1.00 1.00 1.00
		Increase in total nurse hours in medical patients	1.01 1.00 1.01
		Increase by 1 hour in UAP hours in medical patients	1.01 1.00 1.03
		Increase by 1 hour in RN hours in surgical patients	0.97 0.95 1.00
		Increase by 1 hour in LPN in surgical patients	1.01 1.00 1.02
		Increase by 1 hour in licensed hours in surgical patients	1.00 0.99 1.00
		Increase by 1 hour in UAP hours in surgical patients	1.01 0.98 1.04
		Increase by 1 hour in total nursing hours	0.99 0.97 1.00
		Increase by 1 hour in RN hours in medical patients, hospital level analysis, California hospitals	0.99 0.98 1.00
		Increase by 1 hour in LPN hours in medical patients, hospital level analysis, California hospitals	1.05 1.00 1.11
		Increase by 1 hour in UAP hours in medical patients, hospital level analysis, California hospitals	1.03 1.01 1.06
		Increase by 1 hour in total nursing hours in medical patients, hospital level analysis, California hospitals	1.01 0.99 1.02
		Increase by 1 hour of licensed nursing hours in medical patients, hospital level analysis, California hospitals	1.00 0.98 1.01
		Increase by 1 hour of RN hours in medical patients, unit level analysis, California hospitals	0.99 0.97 1.01
		Increase by1 hour in LPN hours in medical patients, unit level	1.04 0.99 1.09

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes		
		analysis, California hospitals			
		Increase by 1 hour in UAP hours/patient day in medical patients, unit level analysis, California hospitals	1.03	1.00	1.06
		Increase by 1 hour in total nursing hours in medical patients, unit level analysis, California hospitals.	1.00	0.99	1.02
		Increase by 1 hour of total licensed hours in medical patients, unit level analysis, California hospitals	1.00	0.98	1.02
		Increase by 1 hour of RN hours in surgical patients, hospital level analysis, California hospitals	0.96	0.94	0.99
		Increase by 1 hour in LPN hours in surgical patients, hospital level analysis, California hospitals	1.09	1.00	1.19
		Increase by 1 hour in UAP hours in surgical patients, hospital level analysis, California hospitals	1.00	0.96	1.05
		Increase by 1 hour in total nursing hours in surgical patients, hospital level analysis, California hospitals	1.90	1.29	2.79
		Increase by 1 hour in licensed hours in surgical patients, hospital level analysis, California hospitals	1.12	1.03	1.22
		Increase by 1% in RN hours/licensed hours in surgical patients, hospital level analysis, California hospitals	0.45	0.22	0.92
		Increase by 1 hour of RN hours in surgical patients, unit level analysis, California hospitals	0.96	0.92	0.99
		Increase by 1 hour in LPN hours in surgical patients, unit level analysis, California hospitals	1.07	0.97	1.17
		Increase by 1 hour in UAP hours in surgical patients, unit level analysis, California hospitals	1.01	0.95	1.06
		Increase by 1 hour in total nursing hours in surgical patients, unit level analysis, California hospitals	0.98	0.95	1.01
		Increase by 1 hour in licensed hours in surgical patients, unit level analysis, California hospitals	1.41	1.00	1.99
		1% increase in RN hours/total licensed hours (RN + LPN)	0.80	0.64	0.97
		Increase by 1 licensed hour (RN + LPN)/patient day	0.98	0.97	1.00
		Increase by 1 licensed hour (RN + LPN)/patient day	1.00	0.99	1.00
		Increase by 1 licensed hour (RN + LPN)/patient day	0.98	0.96	1.00
		Increase by 1 licensed hour (RN + LPN)/patient day	1.00	1.00	1.00
		Increase by 1 licensed hour (RN + LPN)/patient day	1.00	0.99	1.01
		Increase by 1 licensed hour (RN + LPN)/patient day	1.00	1.00	1.01
		Increase by 1 hour of RN in surgical patients	0.98	0.96	0.99
		Increase by 1 hour of RN in medical patients	1.00	0.99	1.01

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes		
			Deep vein thrombosis, pulmonary embolism		
		Increase by 1 hour of RN hours in medical patients	1.01	0.99	1.03
		Increase by 1 hour in RN hours in surgical patients	1.03	1.00	1.06
		Increase by 1 hour in LPN hours in medical patients	0.97	0.93	1.01
		Increase by 1 hour in LPN hours in surgical patients	1.01	0.94	1.08
		Increase by 1 hour in UAP hours in medical patients	1.01	0.98	1.03
		Increase by 1 hour in UAP hours in surgical patients	1.01	0.96	1.05
		Increase by 1 hour in total nursing hours in medical patients	1.00	0.98	1.02
		Increase by 1 hour in total nursing hours in surgical patients	1.02	1.00	1.05
		Increase by 1 hour in licensed hours/patient-day in medical patients	1.01	0.99	1.02
		Increase by 1% of RN hours/total licensed hours per patient day in medical patients	1.39	0.92	2.11
		Increase by 1 hour in licensed hours/patient day in surgical patients	1.03	1.00	1.05
		Increase by 1 hour in RN hours in medical patients	1.00	0.99	1.01
		Increase by 1 hour in LPN hours in medical patients	0.99	0.97	1.00
		Increase by 1 hour in licensed hours in medical patients	1.00	0.99	1.01
		Increase in total nurse hours in medical patients	1.00	0.99	1.02
		Increase by 1 hour in UAP hours in medical patients	1.00	0.97	1.04
		Increase by 1 hour in RN hours in surgical patients	1.00	0.99	1.01
		Increase by 1 hour in LPN in surgical patients	0.97	0.95	0.99
		Increase by 1 hour in licensed hours in surgical patients	1.00	0.99	1.01
		Increase by 1 hour in UAP hours in surgical patients	0.99	0.95	1.04
		Increase by 1 hour in total nursing hours in surgical patients	1.01	0.99	1.04
		Increase by 1 hour in RN hours in medical patients, hospital level analysis, California hospitals	1.00	0.98	1.03
		Increase by 1 hour in LPN hours in medical patients, hospital level analysis, California hospitals	0.91	0.83	1.01
		Increase by 1 hour in UAP hours in medical patients, hospital level analysis, California hospitals	1.01	0.95	1.07
		Increase by 1 hour in total nursing hours in medical patients, hospital level analysis, California hospitals	1.00	0.97	1.02
		Increase by 1 hour of licensed nursing hours in medical patients, hospital level analysis, California hospitals	0.99	0.96	1.02
		Increase by 1 hour of RN hours in medical patients, unit level analysis, California hospitals	1.02	0.98	1.06
		Increase by1 hour in LPN hours in medical patients, unit level analysis, California hospitals	0.50	0.27	0.95

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes		
		Increase by 1 hour in UAP hours/patient day in medical patients, unit level analysis, California hospitals	1.04	0.96	1.12
		Increase by 1 hour in total nursing hours in medical patients, unit level analysis, California hospitals.	1.02	0.98	1.06
		Increase by 1 hour of total licensed hours in medical patients, unit level analysis, California hospitals	1.01	0.97	1.05
		Increase by 1 hour of RN hours in surgical patients, hospital level analysis, California hospitals	1.07	1.03	1.11
		Increase by 1 hour in LPN hours in surgical patients, hospital level analysis, California hospitals	1.05	0.85	1.29
		Increase by 1 hour in UAP hours in surgical patients, hospital level analysis, California hospitals	1.02	0.93	1.12
		Increase by 1 hour in total nursing hours in surgical patients, hospital level analysis, California hospitals	1.06	1.02	1.10
		Increase by 1 hour in licensed hours in surgical patients, hospital level analysis, California hospitals	1.07	1.02	1.12
		Increase by 1% in RN hours/licensed hours in surgical patients, hospital level analysis, California hospitals	0.03	0.00	0.66
		Increase by 1 hour of RN hours in surgical patients, unit level analysis, California hospitals	1.11	1.05	1.17
		Increase by 1 hour in LPN hours in surgical patients, unit level analysis, California hospitals	1.09	0.89	1.33
		Increase by 1 hour in UAP hours in surgical patients, unit level analysis, California hospitals	1.03	0.92	1.14
		Increase by 1 hour in total nursing hours in surgical patients, unit level analysis, California hospitals	1.09	1.03	1.15
		Increase by 1 hour in licensed hours in surgical patients, unit level analysis, California hospitals	1.55	0.18	13.15
			Sepsis		
		1% increase in RN hours/total licensed hours (RN + LPN)	1.04	1.01	1.08
		Increase by 1 hour of RN hours in medical patients	1.01	0.98	1.03
		Increase by 1 hour in RN hours in surgical patients	0.96	0.93	1.00
		Increase by 1 hour in LPN hours in medical patients	1.00	0.95	1.05
		Increase by 1 hour in LPN hours in surgical patients	1.01	0.98	1.03
		Increase by 1 hour in UAP hours in medical patients	0.99	0.96	1.03
		Increase by 1 hour in UAP hours in surgical patients	1.00	0.98	1.01
		Increase by 1 hour in total nursing hours in medical patients	1.00	0.98	1.02
		Increase by 1 hour in total nursing hours in surgical patients	0.99	0.98	1.00
		Increase by 1 hour in licensed hours/patient day in medical patients	1.34	0.91	1.97

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes		
		Increase by 1% of RN hours/total licensed hours per patient day in medical patients	1.01	0.99	1.03
		Increase by 1 hour in licensed hours/patient day in surgical patients	1.00	0.99	1.01
		Increase by 1 hour in RN hours in medical patients	0.98	0.97	0.99
		Increase by 1 hour in LPN hours in medical patients	0.99	0.99	1.00
		Increase by 1 hour in licensed hours in medical patients	0.99	0.98	1.01
		Increase in total nurse hours in medical patients	1.01	0.99	1.04
		Increase by 1 hour in UAP hours in medical patients	0.99	0.98	0.99
		Increase by 1 hour in RN hours in surgical patients	0.98	0.96	0.99
		Increase by 1 hour in LPN in surgical patients	0.96	0.95	0.97
		Increase by 1 hour in licensed hours in surgical patients	1.01	0.97	1.04
		Increase by 1 hour in UAP hours in surgical patients	0.99	0.97	1.01
		Increase by 1 hour in total nursing hours	1.01	0.99	1.04
		Increase by 1 hour in RN hours in medical patients, hospital level analysis, California hospitals	0.96	0.88	1.06
		Increase by 1 hour in LPN hours in medical patients, hospital level analysis, California hospitals	1.02	0.97	1.07
		Increase by 1 hour in UAP hours in medical patients, hospital level analysis, California hospitals	1.01	0.99	1.03
		Increase by 1 hour in total nursing hours in medical patients, hospital level analysis, California hospitals	1.00	0.98	1.03
		Increase by 1 hour of licensed nursing hours in medical patients, hospital level analysis, California hospitals	1.02	0.98	1.05
		Increase by 1 hour of RN hours in medical patients, unit level analysis, California hospitals	0.96	0.88	1.05
		Increase by 1 hour in LPN hours in medical patients, unit level analysis, California hospitals	1.02	0.96	1.08
		Increase by 1 hour in UAP hours/patient day in medical patients, unit level analysis, California hospitals	1.01	0.98	1.04
		Increase by 1 hour in total nursing hours in medical patients, unit level analysis, California hospitals	1.01	0.97	1.04
		Increase by 1 hour of total licensed hours in medical patients, unit level analysis, California hospitals	1.01	0.98	1.04
		Increase by 1 hour of RN hours in surgical patients, hospital level analysis, California hospitals	1.00	0.89	1.13
		Increase by 1 hour in LPN hours in surgical patients, hospital level analysis, California hospitals	1.02	0.96	1.08
		Increase by 1 hour in UAP hours in surgical patients, hospital level	0.59	0.31	1.14

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
		analysis, California hospitals Increase by 1 hour in total nursing hours in surgical patients, hospital level analysis, California hospitals Increase by 1 hour in licensed hours in surgical patients, hospital level analysis, California hospitals Increase by 1% in RN hours/licensed hours in surgical patients, hospital level analysis, California hospitals Increase by 1 hour of RN hours in surgical patients, unit level analysis, California hospitals Increase by 1 hour in LPN hours in surgical patients, unit level analysis, California hospitals Increase by 1 hour in UAP hours in surgical patients, unit level analysis, California hospitals Increase by 1 hour in total nursing hours in surgical patients, unit level analysis, California hospitals Increase by 1 hour in licensed hours in surgical patients, unit level analysis, California hospitals 1% increase in RN hours/total licensed hours (RN + LPN) Increase by 1 licensed hour (RN + LPN)/patient day Increase by 1 licensed hour (RN + LPN)/patient day Increase by 1 licensed hour (RN + LPN)/patient day Increase by 1 licensed hour (RN + LPN)/patient day Increase by 1 licensed hour (RN + LPN)/patient day	1.01 0.98 1.04 0.12 0.01 1.01 1.03 0.98 1.08 1.06 0.94 1.19 1.02 0.95 1.08 1.03 0.99 1.07 1.04 1.00 1.09 1.39 0.85 1.94 1.01 0.98 1.03 0.99 0.98 0.99 0.99 0.96 1.01 0.99 0.99 1.00 0.99 0.97 1.00 0.99 0.98 1.01
Potter[40] Medical records; (number of falls on a unit/number of patient days) * 1,000. Administrative hospital data; an average number of nursing care per patient day on the day shift, proportion of UAP hours of direct patient care	Hospitals 1 Unit ICU Patients Medical	Period Hour RN hour Means in time period Feb-Apr 2000 3 1.67 Means in time period May-Jul 2000 3 1.61 Means in time period Aug-Oct 2000 3 1.69 Means in time period Nov 2000-Jan 2001 3 1.77	Falls, rate/100 patient days 0.30 0.29 0.30 0.23
Ritter-Teitel[69] Hospital Incidence reports; % of patients with urinary tract infections not presented at admission among total discharged or sampled	Hospitals 28	Time, Place Hour RN hours UAP hours 1997 9.3 5.1 2.4 1998 9.6 5.3 2.6 Medical Units 1997 9.2 5.0 2.5 Medical Units 1998 9.8 5.5 2.7	Rate, % ± SD Urinary tract infection 2.09 ± 2.25 2.53 ± 2.29 2.25 ± 2.36 2.61 ± 2.46

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories				Patient Outcomes
patients, % of patients with pressure ulcers, number of events/1,000 patient days. Labor Productivity Program Database and nurse survey; Total nursing hours worked/ patient-day, RN hours worked/patient day, UAP hours worked/patient day		Surgical Units 1997	9.4	5.2	2.3	1.93 ± 2.18
		Surgical Units 1998	9.4	5.1	2.6	2.45 ± 2.16
						Falls
		1997	9.3	5.1	2.4	0.32 ± 0.20
		1998	9.6	5.3	2.6	0.34 ± 0.16
		Medical Units 1997	9.2	5.0	2.5	0.40 ± 0.21
		Medical Units 1998	9.8	5.5	2.7	0.41 ± 0.17
		Surgical Units 1997	9.4	5.2	2.3	0.24 ± 0.14
		Surgical Units 1998	9.4	5.1	2.6	0.27 ± 0.12
						Pressure ulcers
		1997	9.3	5.1	2.4	2.42 ± 2.10
		1998	9.6	5.3	2.6	2.06 ± 1.66
		Medical Units 1997	9.2	5.0	2.5	2.33 ± 2.12
		Medical Units 1998	9.8	5.5	2.7	2.23 ± 1.94
		Surgical Units 1997	9.4	5.2	2.3	2.50 ± 2.11
		Surgical Units 1998	9.4	5.1	2.6	1.88 ± 1.33
						Urinary tract infection
		Increase by 1 hour in RN hours				-0.18 ± 1.24
						Falls
		Increase by 1 hour in RN hours				-0.42 ± 0.90
		Increase by 1 hour in RN hours				-0.24 ± 1.18
						Falls
		Increase by 1hour in RN hours in medical units				-0.49 ± 0.87
		Increase by 1hour in RN hours in surgical units				-0.15 ± 0.96

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Robert[6] Case—all patients hospitalized in ICU >3 days with a primary BSI during the study period. Controls—randomly selected patients hospitalized ≥3 days in the same unit; primary bloodstream infections (BSIs) (CDC), Index date for cases-the day of 1 positive blood culture; for controls = (cases LOS before BSI/total cases LOS) * control total LOS. Administrative hospital data; total nursing hours-patient day	Hospitals 1 Unit ICU Patients Surgical	Hour/patient day Lower % of temporary nurses 13.5 High proportion of temporary nurses 12.8 Lower % of temporary nurses 13.5 High proportion of temporary nurses 12.8	Nosocomial infection Rate/100 patient days 1.00 3.20 Relative risk 1.00 1.00 1.00 3.20 1.20 8.20
Seago[93] Incident reporting system; Decubitus ulcers, rate/1,000 patient days. ANSOS/TSI database; Both RN and non-RN hours divided by total patient day, RN hours divided by total patient days	Hospitals 1 Unit Combined Patients Medical	Nursing hours RN hours Medical surgical unit A 8 6 Medical surgical unit B 8 8 Medical surgical unit C 7 5 Medical surgical unit A 8 6 Medical surgical unit B 8 8 Medical surgical unit C 7 5	Rate per 100 patient days ± SD Decubitus ulcer 0.78 ± 0.09 0.02 ± 0.05 0.05 ± 0.08 Falls 0.35 ± 0.20 0.19 ± 0.19 0.45 ± 0.25

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Simmonds[82] Active microbiological surveillance of all chronic patients admitted for >30 days of hemodialysis; volunteering patient participation in other units % of patients with positive colonization of vancomycin-resistant enterococci 48 hours after admission to the hospital and after surgery. Administrative reports of Patient Care Manager and Nursing Workload Specialist; Integrated Nursing System database; Total nursing FTE per shift * 8 hours/beds in the units	Hospitals 1 Unit Specialized Patients Medical Age 68.75 Sex 55.8	Nursing hours RN hours 5.5 4.2 5.7 4.3 5.9 4.3 6.0 4.4 5.5 5.7 5.9 6.0	Rate % 1.61 3.29 4.97 6.65 1.56 1.33 1.11 1.11
Sovie[71] Incident reports; nosocomial infection (not present at admission or within 72 hours after); the number of infections / number of patients discharged * 100 at hospital level, any lesions caused by unrelieved pressure not presented in admission; annual rate (%) at hospital level, any fall or slip in which a patient came to rest unintentionally on the floor; the ratio of the number of falls in a unit (or area) to the number of patient days * 1000. The MECON-PEERx	Hospitals 29 Unit Combined Patients Combined	Hospital nursing department, 1997 Nurse hours RN hours UAP hours 14 8.45 3 Hospital nursing department, 1998 Nurse hours RN hours UAP hours 13 8.09 3 Medical units, 1997 Nurse hours RN hours UAP hours 9.1 5.1 2 Medical units 1998 Nurse hours RN hours UAP hours 9.8 5.52 3 Surgical units, 1997 Nurse hours RN hours UAP hours 9.3 5.18 2 Surgical units, 1998 Nurse hours RN hours UAP hours 9.4 5.15 3	Rate, % ± SD UTI 2.64 ± 1.67 2.02 ± 1.43 2.17 ± 2.49 2.61 ± 2.56 1.87 ± 2.29 2.45 ± 2.24

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Operations Benchmarking Database Reports; the office of the chief nurse executives; nursing survey; Hours Worked per patient day, RN hours worked per patient day, UAP hours worked per patient day		Hospital nursing department, 1997 Nurse hours RN hours UAP hours 14 8.45 3 Hospital nursing department, 1998 Nurse hours RN hours UAP hours 13 8.09 3 Medical units, 1997 Nurse hours RN hours UAP hours 9.1 5.1 2 Medical units 1998 Nurse hours RN hours UAP hours 9.8 5.52 3 Surgical units, 1997 Nurse hours RN hours UAP hours 9.3 5.18 2 Surgical units, 1998 Nurse hours RN hours UAP hours 9.4 5.15 3 Hospital nursing department, 1997 Nurse hours RN hours UAP hours 14 8.45 3 Hospital nursing department, 1998 Nurse hours RN hours UAP hours 13 8.09 3 Medical units, 1997 Nurse hours RN hours UAP hours 9.1 5.1 2 Medical units 1998 Nurse hours RN hours UAP hours 9.8 5.52 3 Surgical units, 1997 Nurse hours RN hours UAP hours 9.3 5.18 2 Surgical units, 1998 Nurse hours RN hours UAP hours 9.4 5.15 3	Falls 2.88 ± 1.20 2.95 ± 0.91 3.97 ± 2.10 4.11 ± 1.68 2.42 ± 1.41 2.69 ± 1.19 Pressure Ulcers 3.53 ± 1.82 3.14 ± 2.63 2.61 ± 2.56 2.23 ± 1.94 2.68 ± 2.22 1.88 ± 1.33

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
		Increase by 1 hour in RN hours Increase by 1 hour in total nursing hours Increase by 1 hour in total nursing hours Increase by 1 hour in total nursing hours	Falls -0.43 ± 0.18 UTI -0.65 ± 0.23 Falls -0.33 ± 0.14 Pressure ulcers -0.32 ± 0.15
Stegenga[78] Patients and laboratory records Nosocomial viral gastrointestinal infections (NVGIs) (CDC definition). Rate = number of NVGIs / 1,000 patient days. Administrative hospital records; Total nursing hours/patient day. Total hours included educational and overtime hours but not vacation. Total hours were calculated 72 hours before and after infection event	Hospitals 1 Unit ICU Patients Medical	Nursing hours Preinfection night shifts 12.5 Postinfection night shifts 13 Nursing hours/patient days >10.5 12 Nursing hours/patient days <10.5 6.5 Nursing hours/patient days >10.5 12 Nursing hours/patient days <10.5 6.5	Nosocomial infection/100 patient days 1.30 0.00 1.01 3.21 Relative risk, 95% CI 1.00 1.00 1.00 2.94 2.16 4.01

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories				Patient Outcomes
Stratton[91]	Hospitals = 7	Nursing hours	RN hours	LPN hours	Aide hours	Nosocomial infection
Medical records, hospital	Units					Rate/100 patient days ± SD
incidence and infection	Medical/surgical units, quarter 1	9.54	7.04	0.22	2.28	0.75 ± 0.69
control records, surveys						
rate/1,000 patient days of	Medical/surgical units, quarter 2	9.98	7.26	0.21	2.51	0.53 ± 0.67
respiratory, gastrointestinal,						
bloodstream and central line	Medical/surgical units, quarter 3	10.5	7.65	0.22	2.63	0.71 ± 0.77
infections in hospitalized						
patients not present at time of	Medical/surgical units, quarter 4	9.97	7.46	0.19	2.33	0.64 ± 0.43
admission; rate/1,000 patient						
days of bloodstream and	Oncology units, quarter 1	11.33	9.4	0.33	1.55	0.65 ± 0.23
central line infections in	Oncology units, quarter 2	11.37	8.93	0.47	1.92	0.62 ± 0.39
hospitalized patients not	Oncology units, quarter 3	12.77	10.1	0.46	2.16	0.71 ± 0.59
present at time of admission.	Oncology units, quarter 4	12.41	9.9	0.36	2.06	0.85 ± 0.50
Payroll records from the	ICU units, quarter 1	18.86	16.8	0.02	2.02	0.73 ± 0.56
National Association of	ICU units, quarter 2	19.37	17.1	0.03	2.3	1.03 ± 0.96
Children's Hospitals and	ICU units, quarter 3	20.2	17.6	0.03	2.55	0.80 ± 0.69
Related Institutions	ICU units, quarter 4	19.59	17.3	0.02	2.32	0.95 ± 0.71
(NACHRI);	All units, quarter 1	13.1				0.51 ± 0.08
Average in each quarter 2002	All units, quarter 2	13.5				0.79 ± 0.17
of total hours of productive	All units, quarter 3	14.25				0.66 ± 0.12
nursing care/patient day	All units, quarter 4	13.72				0.56 ± 0.17
adjusted for short-stay patients		Increase by 1 hour in total nursing hours				0.01 ± 0.03

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories					Patient Outcomes
Tallier[83] Hospital acquired retrospective data; Nosocomial urinary tract infection, incidence rate/1,000 patient day developed 72 hours after admission Pressure ulcers-Incidence rate/1,000 patient days developed more than 72 hours after admission. Nursing Care hours reports, Nursing Daily Staffing Sheets; total productive nursing hours/patient day	Hospitals 1 Unit Combined Patients Medical	Time 2000, 4th quarter 2001, 1st quarter October 2000 November 2000 December 2000 January 2001 February 2001 March 2001 2000, 4th quarter 2001, 1st quarter October 2000 November 2000 December 2000 January 2001 February 2001 March 2001	Nurse hours 5.84 5.67 6.2 5.77 5.76 5.69 5.27 6.05 5.84 5.67 6.2 5.77 5.76 5.69 5.27 6.05	RN hours 5.85 5.87 5.5 6.88 6.64 6.83 5.85 5.87 5.5 6.88 6.64 6.83	LPN hours 0.87 1 0.93 1.08 1.04 1.11 0.87 1 0.93 1.08 1.04 1.11	UAP hours 3.58 3.31 3.29 3.67 3.29 3.41 3.58 3.31 3.29 3.67 3.29 3.41	Rate/100 patient days UTI 0.78 0.24 1.10 0.90 1.50 0.70 0.30 0.30 Pressure ulcers 0.17 0.29 0.10 0.60 0.10 0.90 0.60 0.10
Wan[52] Hospital records; Falls, incidence/1,000 patient days adjusted for severity of incident Hospital staffing records; Nursing hours/patient day, LPN hours/total nursing hours	Hospitals 45 Unit Combined Patients Combined	Increase by 1 hour in total nursing hours Nurse hours RN hours LPN hours 4.93 2.56 1.63					Falls, rate/100 patient days 0.03 0.31 ± 0.05

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Whitman[36] Hospital discharge data; The number of hospital-acquired pressure ulcers (≥grade II) divided by the number of patients visually assessed by the nursing staff for skin breakdown; number of unplanned descents to the floor with or without injury times 1,000 divided by the total number of patient days on each unit; number of nosocomial CLI times 1,000 divided by the number of central catheter line days (the number of days central intravenous catheters were in place in patients). Hospitals system's finance department; Total worked hours (paid hours minus sick, vacation, and holiday hours) for all personnel (RN, licensed practical nurses, nursing aides, secretaries): total worked hours/the monthly patient days for each unit	Hospitals: 10	Nurse hours Mean in noncardiac ICU 18.8 Mean in noncardiac ICU 18.9 Mean in noncardiac IMC 8.9 Mean in cardiac IMC 8.4 Mean in medical/surgical 4 Mean in noncardiac ICU 18.8 Mean in noncardiac ICU 18.9 Mean in noncardiac IMC 8.9 Mean in cardiac IMC 8.4 Mean in medical/surgical 4	Rate/100 patient days ± SD Falls 0.01 ± 0.12 0.07 ± 0.06 0.31 ± 0.17 0.35 ± 0.13 0.49 ± 0.48 Pressure ulcers 0.07 ± 0.05 0.11 ± 0.09 0.05 ± 0.05 0.03 ± 0.03 0.03 ± 0.03

Table G11. Evidence of the association between nurse hours/patient day and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes, Source to Measure Nurse Staffing, Definition of Nurse Hours	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories					Patient Outcomes	
Zidek[85] Patient records and chart audits New incidence of skin breakdown acquired over the course of the hospital stay, number of reported unplanned descent to the floor during the course of the hospital stay. Administrative records; total nursing hours/patient day calculated from % of RN FTE/ total FTE calculated from % of LPN FTE/total FTE calculated from % of UAP FTE/total FTE	Hospitals 1 Unit Combined Patients Medical and surgical		Nurse hours	RN hours	LPN hours	UAP hours	Rate, %	
							Falls	Pressure ulcers
		1999, 1st quarter	6.6	2.1	3.84	0.73	0.59	0.18
		1999, 2nd quarter	8.4	2.6	4.73	1.1	0.45	0.05
		1999, 3rd quarter	7.3	2	4.06	1.16	0.83	0.26
		1999, 4th t quarter	8.2	2.6	4.85	0.74	0.52	0.09
		2000, 1st quarter	6.9	2.1	4.14	0.69	0.28	0.00
		2000, 2nd quarter	10.2	3.1	5.90	1.22	0.25	0.06
		2000, 3rd quarter	8.3	2.6	4.45	1.25	0.23	0.17
		2000, 4th quarter	9	3	5.13	0.9	0.63	0.37
		2001, 1st quarter	7.3	2.3	4.21	0.73	0.61	0.09
		2001, 2nd quarter	8.8	2.7	5.09	0.96	0.62	0.24
		2001, 3rd quarter	11.2	3.7	6.17	1.35	0.66	0.18
		2001, 4th quarter	8.5	2.5	4.91	1.02	0.66	0.11

Dec Ulcer = Decubitus Ulcer; DRG = Diagnosis Related Group; DVT = Deep Vein Thrombosis; ICU = Intensive Care Unit; IMC = Intermediate Care; LPN = Licensed Practical Nurse; NICU = Neonatal Intensive Care Unit; NS = Not Significant; RN = Registered Nurse; RR = Relative Risk; SD = Standard Deviation; SWI = Surgical Wound Infection; UAP = Unlicensed Assistive Personnel; UTI = Urinary Tract Infection

Table G12. Patient outcomes corresponding to an increase by 1 nursing hour/patient day (calculated from published results, more studies contributed to pooled analysis)

Studies	Outcomes	Measure	Effect	Significance
Simmonds[82]	Nosocomial infection	Rate		NS
Ritter-Teitel[69]	Pressure ulcers	Rate	0.29	<.0001
Ritter-Teitel[69]	Urinary tract infection	Rate	0.30	<.0001
Ritter-Teitel[69]	Falls	Rate	0.08	<.0001
Cho[30]	Sepsis	Rate		NS
Cho[30]	Pressure ulcers	Rate		NS
Cho[30]	Pneumonia	Rate		NS
Cho[30]	Urinary tract infection	Rate		NS
Cho[30]	Falls	Rate		NS
Zidek[85]	Pressure ulcers	Rate		NS
Zidek[85]	Falls	Rate		NS
Tallier[83]	Pressure ulcers	Rate*		NS
Tallier[83]	Urinary tract infection	Rate*		NS
Cimiotti[87]	Sepsis	Rate		NS
Cimiotti[87]	Nosocomial infection	Rate		NS
Cimiotti[87]	Nosocomial infection	Relative risk	0.92	0.001
Cimiotti[87]	Pneumonia	Rate		NS
Stratton[91]	Nosocomial infection	Rate*	0.04	<.0001
Blegen[59]	Nosocomial infection	Rate*		NS
Blegen[59]	Urinary tract infection	Rate*	0.24	0.010
Blegen[58]	Falls	Rate*		NS
Blegen[58]	CPR	Rate*		NS
Robert[6]	Sepsis	Rate*		NS
Robert[6]	Sepsis	Relative risk		NS
Robert[6]	Nosocomial infection	Rate*		NS
Robert[6]	Nosocomial infection	Relative risk		NS
Blegen[73]	Falls	Rate*	0.03	0.010
Bolton[26]	Pressure ulcers	Rate*		NS
Bolton[26]	Falls	Rate*		NS
Sovie[71]	Pressure ulcers	Rate	0.29	<.0001
Sovie[71]	Urinary tract infection	Rate	0.24	0.010
Sovie[71]	Falls	Rate		NS
Stegenga[78]	Nosocomial infection	Rate*		NS
Stegenga[78]	Nosocomial infection	Relative risk		NS
Whitman[36]	Pressure ulcers	Rate*		NS
Whitman[36]	Falls	Rate*	-0.03	0.001
Potter[40]	Falls	Rate*		NS
Langemo[41]	Pressure ulcers	Rate		NS
Seago[93]	Falls	Rate*		NS
Donaldson[9]	Pressure ulcers	Rate*		NS
Donaldson[9]	Falls	Rate*	-0.02	0.031
Needleman[28]	Sepsis	Rate		NS
Needleman[28]	Shock	Rate		NS
Needleman[28]	Gastrointestinal bleeding	Rate		NS
Needleman[28]	Pressure ulcers	Rate		NS

Table G12. Patient outcomes corresponding to an increase by 1 nursing hour/patient day (calculated from published results, more studies contributed to pooled analysis) (continued)

Studies	Outcomes	Measure	Effect	Significance
Needleman[28]	Surgical wound infection	Relative risk		NS
Needleman[28]	Deep vein thrombosis	Rate		NS
Needleman[28]	Pulmonary Failure	Rate		NS
Needleman[28]	Pneumonia	Rate		NS
Needleman[28]	Urinary tract infection	Rate		NS
Needleman[28]	Failure to rescue	Rate		NS

CPR = Cardiopulmonary Resuscitation; NS = Not Significant
* Rate per 100 patient days

Table G13. Relative risk of patient outcomes corresponding to an increase by 1 nurse hour/patient day as reported by authors

Author	Data	Analytic unit	Hospitals	Unit	Patients	Outcome	Relative Risk	95% CI
Needleman[28]	Administrative	Hospital	4,156	Medical	Medical	UTI	1.00	1.00; 1.01
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	UTI	1.01	1.00; 1.02
Needleman[28]	Administrative	Hospital	3,357	Medical	Medical	UTI	1.00	0.99; 1.01
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	UTI	1.00	0.99; 1.02
Needleman[28]	Administrative	Hospital	256	Medical	Medical	UTI	1.00	0.98; 1.01
Needleman[28]	Administrative	Unit	256	Medical	Medical	UTI	0.99	0.97; 1.01
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	UTI	1.00	0.98; 1.03
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	UTI	0.81	0.66; 0.98
Cho[38]	Administrative	Patient	232	Combined	Combined	UTI	1.02	0.95; 1.08
Needleman[28]	Administrative	Hospital	4,156	Medical	Medical	GIB	0.99	0.98; 1.01
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	GIB	0.99	0.97; 1.01
Needleman[28]	Administrative	Hospital	3,357	Medical	Medical	GIB	0.99	0.97; 1.00
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	GIB	0.99	0.97; 1.02
Needleman[28]	Administrative	Hospital	256	Medical	Medical	GIB	0.99	0.97; 1.01
Needleman[28]	Administrative	Unit	256	Medical	Medical	GIB	0.99	0.96; 1.01
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	GIB	0.85	0.67; 1.09
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	GIB	0.74	0.57’ 0.96
Needleman[28]	Administrative	Hospital	4,156	Medical	Medical	Pneumonia	1.00	0.99; 1.01
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	Pneumonia	1.02	1.00; 1.05
Needleman[28]	Administrative	Hospital	3,357	Medical	Medical	Pneumonia	1.10	1.01; 1.19
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	Pneumonia	1.03	1.00; 1.05
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Pneumonia	1.00	0.99; 1.01
Needleman[28]	Administrative	Unit	256	Medical	Medical	Pneumonia	0.99	0.97; 1.01
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	Pneumonia	1.03	1.01; 1.06
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	Pneumonia	1.03	0.99; 1.08
Cho[38]	Administrative	Patient	232	Combined	Combined	Pneumonia	0.96	0.91; 1.01
Needleman[28]	Administrative	Hospital	4,156	Medical	Medical	Shock	0.84	0.71; 0.99
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	Shock	0.99	0.97; 1.01
Needleman[28]	Administrative	Hospital	3,357	Medical	Medical	Shock	1.00	0.99; 1.02
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	Shock	1.00	0.98; 1.03
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Shock	1.02	0.99; 1.04

Table G13. Relative risk of patient outcomes corresponding to an increase by 1 nurse hour/patient day as reported by authors (continued)

Author	Data	Analytic unit	Hospitals	Unit	Patients	Outcome	Relative Risk	95% CI
Needleman[28]	Administrative	Unit	256	Medical	Medical	Shock	1.01	0.97; 1.05
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	Shock	1.00	0.97; 1.03
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	Shock	1.01	0.97; 1.06
Needleman[28]	Administrative	Hospital	4,156	Medical	Medical	Failure to rescue	1.01	1.00; 1.01
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	Failure to rescue	0.99	0.98; 1.01
Needleman[28]	Administrative	Hospital	3,357	Medical	Medical	Failure to rescue	1.01	1.00; 1.01
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	Failure to rescue	0.99	0.97; 1.00
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Failure to rescue	1.01	0.99; 1.02
Needleman[28]	Administrative	Unit	256	Medical	Medical	Failure to rescue	1.00	0.99; 1.02
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	Failure to rescue	1.90	1.29; 2.79
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	Failure to rescue	0.98	0.95; 1.01
Cho[38]	Administrative	Patient	232	Combined	Combined	Falls	1.08	0.99; 1.18
Needleman[28]	Administrative	Hospital	4,156	Medical	Medical	Falls	1.00	0.99; 1.02
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	Pressure ulcers	0.99	0.97; 1.02
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	Pressure ulcers	0.99	0.97; 1.01
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Pressure ulcers	1.02	1.00; 1.04
Needleman[28]	Administrative	Unit	256	Medical	Medical	Pressure ulcers	1.02	0.99; 1.05
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	Pressure ulcers	0.82	0.64; 1.05
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	Pressure ulcers	0.64	0.46; 0.88
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	SWI	1.00	0.99; 1.02
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	SWI	1.01	0.99; 1.03
Cho[38]	Administrative	Patient	232	Combined	Surgical	SWI	1.00	0.95; 1.06
Needleman[28]	Administrative	Hospital	4,156	Medical	Medical	DVT	1.00	0.98; 1.02
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	DVT	1.02	1.00; 1.05
Needleman[28]	Administrative	Hospital	3,357	Medical	Medical	DVT	1.00	0.99; 1.02
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	DVT	1.01	0.99; 1.04
Needleman[28]	Administrative	Hospital	256	Medical	Medical	DVT	1.00	0.97; 1.02
Needleman[28]	Administrative	Unit	256	Medical	Medical	DVT	1.02	0.98; 1.06
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	DVT	1.06	1.02; 1.10
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	DVT	1.09	1.03; 1.15
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	Complications	1.03	1.01; 1.06
Needleman[28]	Administrative	Hospital	3,357	Medical	Medical	Complications	1.25	1.05; 1.50
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	Complications	1.03	1.00; 1.06

Table G13. Relative risk of patient outcomes corresponding to an increase by 1 nurse hour/patient day as reported by authors (continued)

Author	Data	Analytic unit	Hospitals	Unit	Patients	Outcome	Relative Risk	95% CI
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Complications	1.02	0.99; 1.05
Needleman[28]	Administrative	Unit	256	Medical	Medical	Complications	1.06	1.01; 1.10
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	Complications	0.39	0.14; 1.13
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	Complications	1.10	1.03; 1.18
Needleman[28]	Administrative	Hospital	4,156	Medical	Medical	Sepsis	1.00	0.98; 1.01
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	Sepsis	1.00	0.98; 1.02
Needleman[28]	Administrative	Hospital	3,357	Medical	Medical	Sepsis	0.99	0.98; 1.01
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	Sepsis	0.99	0.97; 1.01
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Sepsis	1.01	0.99; 1.03
Needleman[28]	Administrative	Unit	256	Medical	Medical	Sepsis	1.01	0.98; 1.04
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	Sepsis	0.59	0.31; 1.14
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	Sepsis	1.03	0.99; 1.07
Cho[38]	Administrative	Patient	232	Combined	Medical	Sepsis	1.01	0.95; 1.08

DVT = Deep vein thrombosis; GIB = Gastrointestinal bleeding; SWI = Surgical wound infection; UTI = Urinary tract infection

Table G14. Patient outcomes corresponding to an increase by 1 RN hour/patient day (calculated from published results, more studies contributed to pooled analysis)

Studies	Outcomes	Measure	Effect	Significance
Simmonds[82]	Nosocomial infection	Rate		NS
Ritter-Teitel[69]	Pressure ulcers	Rate		NS
Ritter-Teitel[69]	Urinary tract infection	Rate		NS
Ritter-Teitel[69]	Falls	Rate		NS
Cho[30]	Sepsis	Rate		NS
Cho[30]	Pressure ulcers	Rate		NS
Cho[30]	Surgical wound infection	Rate		NS
Cho[30]	Pneumonia	Rate		NS
Cho[30]	Urinary tract infection	Rate		NS
Cho[30]	Falls	Rate		NS
Zidek[85]	Pressure ulcers	Rate		NS
Zidek[85]	Falls	Rate		NS
Tallier[83]	Pressure ulcers	Rate*		NS
Tallier[83]	Urinary tract infection	Rate*	-0.70	0.019
Cimiotti[87]	Sepsis	Rate		NS
Cimiotti[87]	Nosocomial infection	Rate		NS
Cimiotti[87]	Nosocomial infection	Relative risk		NS
Cimiotti[87]	Pneumonia	Rate		NS
Stratton[91]	Nosocomial infection	Rate*	0.02	0.012
Fridkin[1]	Sepsis	Rate*		NS
Fridkin[1]	Sepsis	Relative risk	0.71	<.0001
Fridkin[1]	Nosocomial infection	Rate*		NS
Fridkin[1]	Nosocomial infection	Relative risk	0.71	<.0001
Archibald[57]	Nosocomial infection	Rate*		NS
Blegen[58]	Falls	Rate*		NS
Blegen[58]	CPR	Rate*	0.03	0.042
Kovner[22]	Pulmonary failure	Rate		NS
Kovner[22]	Pneumonia	Rate		NS
Blegen[73]	Falls	Rate*	0.04	0.010
Bolton[26]	Pressure ulcers	Rate*		NS
Bolton[26]	Falls	Rate*		NS
Sovie[71]	Pressure ulcers	Rate	0.32	0.032
Sovie[71]	Urinary tract infection	Rate		NS
Sovie[71]	Falls	Rate		NS
Kovner[35]	Deep vein thrombosis	Rate	-0.11	<.0001
Kovner[35]	Pulmonary failure	Rate		NS
Kovner[35]	Pneumonia	Rate		NS
Kovner[35]	Urinary tract infection	Rate		NS
Kovner[35]	Urinary tract infection	Relative risk		NS
Cho[38]	Sepsis	Relative risk		NS
Cho[38]	Surgical wound infection	Relative risk		NS
Cho[38]	Pulmonary failure	Relative risk		NS
Cho[38]	Pneumonia	Rate	-0.16	<.0001
Cho[38]	Pneumonia	Relative risk		NS
Cho[38]	Urinary tract infection	Relative risk		NS

Table G14. Patient outcomes corresponding to an increase by 1 RN hour/patient day (calculated from published results, more studies contributed to pooled analysis) (continued)

Studies	Outcomes	Measure	Effect	Significance
Cho[38]	Falls	Relative risk		NS
Potter[40]	Falls	Rate*		NS
Langemo[41]	Pressure ulcers	Rate		NS
Mark[89]	Pneumonia	Relative risk		NS
Mark[89]	Urinary tract infection	Relative risk		NS
Seago[93]	Falls	Rate*		NS
Donaldson[9]	Pressure ulcers	Rate*		NS
Donaldson[9]	Falls	Rate*		NS
Needleman[28]	Sepsis	Rate		NS
Needleman[28]	Shock	Rate		NS
Needleman[28]	Gastrointestinal bleeding	Rate		NS
Needleman[28]	Pressure ulcers	Rate		NS
Needleman[28]	Surgical wound infection	Rate		NS
Needleman[28]	Surgical wound infection	Relative risk		NS
Needleman[28]	Deep vein thrombosis	Rate		NS
Needleman[28]	Pulmonary failure	Rate		NS
Needleman[28]	Pneumonia	Rate		NS
Needleman[28]	Urinary tract infection	Rate		NS
Needleman[28]	Failure to rescue	Rate		NS

NS = Not significant
* Rate per 100 patient days

Table G15. Relative risk of patient outcomes corresponding to an increase by 1 RN hour/patient day as reported by authors

Author	Data	Analytic Unit	Hospitals	Units	Patients	Outcomes	Relative Risk	95% CI
Berney[84]	Administrative	Hospital	161	Medical	Medical	UTI	0.99	0.98; 1.01
Berney[84]	Administrative	Hospital	161	Surgical	Surgical	UTI	0.98	0.96; 1.00
Needleman[28]	Administrative	Hospital	4,156	Medical	Medical	UTI	0.99	0.98; 0.99
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	UTI	1.00	0.98; 1.02
Needleman[28]	Administrative	Hospital	3,,357	Medical	Medical	UTI	0.99	0.99; 1.00
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	UTI	0.99	0.98; 1.00
Needleman[28]	Administrative	Hospital	256	Medical	Medical	UTI	0.99	0.97; 1.00
Needleman[28]	Administrative	Hospital	256	Medical	Medical	UTI	0.98	0.96; 1.00
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	UTI	0.87	0.77; 0.99
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	UTI	0.77	0.59; 0.99
Cho[38]	Administrative	Hospital	232	Combined	Medical	UTI	1.01	0.93; 1.08
Needleman[28]	Administrative	Hospital	799	Combined	Surgical	UTI	1.00	0.98; 1.02
Needleman[28]	Administrative	Hospital	799	Combined	Medical	UTI	0.99	0.98; 1.00
Berney[84]	Administrative	Hospital	161	Surgical	Surgical	GIB	0.95	0.92; 0.99
Needleman[28]	Administrative	Hospital	4,156	Medical	Medical	GIB	0.98	0.97; 0.99
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	GIB	0.98	0.96; 1.01
Needleman[28]	Administrative	Hospital	3,357	Medical	Medical	GIB	0.99	0.99; 1.00
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	GIB	0.98	0.98; 0.99
Needleman[28]	Administrative	Hospital	256	Medical	Medical	GIB	0.98	0.96; 1.00
Needleman[28]	Administrative	Hospital	256	Medical	Medical	GIB	0.98	0.95; 1.01
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	GIB	1.01	0.98; 1.05
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	GIB	1.03	0.98; 1.08
Needleman[29]	Administrative	Hospital	799	Combined	Medical	GIB	0.98	0.97; 0.99
Needleman[28]	Administrative	Hospital	4,156	Medical	Medical	Pneumonia	0.99	0.98; 1.00
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	Pneumonia	1.00	0.98; 1.03
Needleman[28]	Administrative	Hospital	3,357	Medical	Medical	Pneumonia	1.00	0.99; 1.00
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	Pneumonia	0.99	0.98; 1.00
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Pneumonia	0.99	0.97; 1.01

Table G15. Relative risk of patient outcomes corresponding to an increase by 1 RN hour/patient day as reported by authors (continued)

Author	Data	Analytic Unit	Hospitals	Units	Patients	Outcomes	Relative Risk	95% CI
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Pneumonia	0.98	0.96; 1.00
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	Pneumonia	1.02	0.99; 1.04
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	Pneumonia	1.02	0.98; 1.07
Cho[38]	Administrative	Hospital	232	Combined	Medical	Pneumonia	0.91	0.85; 0.97
Needleman[29]	Administrative	Hospital	799	Combined	Medical	Pneumonia	0.99	0.98; 1.00
Needleman[28]	Administrative	Hospital	4,156	Medical	Medical	Shock	0.98	0.96; 1.00
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	Shock	0.99	0.96; 1.02
Needleman[28]	Administrative	Hospital	3,357	Medical	Medical	Shock	0.99	0.98; 1.00
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	Shock	0.99	0.98; 1.00
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Shock	0.97	0.94; 1.00
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Shock	0.97	0.92; 1.01
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	Shock	0.97	0.94; 1.00
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	Shock	1.55	1.12; 2.15
Needleman[29]	Administrative	Hospital	799	Combined	Medical	Shock	0.98	0.96; 1.01
Berney[84]	Administrative	Hospital	161	Medical	Medical	Failure to rescue	0.98	0.97; 0.99
Berney[84]	Administrative	Hospital	161	Surgical	Surgical	Failure to rescue	0.98	0.97; 0.99
Needleman[28]	Administrative	Hospital	4,156	Medical	Medical	Failure to rescue	1.00	0.99; 1.01
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	Failure to rescue	0.98	0.96; 0.99
Needleman[28]	Administrative	Hospital	3,357	Medical	Medical	Failure to rescue	1.00	0.99; 1.00
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	Failure to rescue	0.97	0.95; 1.00
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Failure to rescue	0.99	0.98; 1.00
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Failure to rescue	0.99	0.97; 1.01
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	Failure to rescue	0.96	0.94; 0.99
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	Failure to rescue	0.96	0.92; 0.99
Needleman[29]	Administrative	Hospital	799	Combined	Surgical	Failure to rescue	0.98	0.96; 0.99
Needleman[29]	Administrative	Hospital	799	Combined	Medical	Failure to rescue	1.00	0.99; 1.01
Cho[38]	Administrative	Hospital	232	Combined	Medical	Falls	1.07	0.96; 1.19
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	Pulmonary failure	1.00	0.98; 1.02
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	Pulmonary failure	1.00	0.99; 1.00
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	Pulmonary failure	0.99	0.96; 1.02

Table G15. Relative risk of patient outcomes corresponding to an increase by 1 RN hour/patient day as reported by authors (continued)

Author	Data	Analytic Unit	Hospitals	Units	Patients	Outcomes	Relative Risk	95% CI
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	Pulmonary failure	0.99	0.94; 1.04
Cho[38]	Administrative	Hospital	232	Combined	Combined	Pulmonary failure	1.11	0.97; 1.27
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	Pressure ulcers	0.99	0.97; 1.00
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Pressure ulcers	0.98	0.96; 1.01
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Pressure ulcers	0.99	0.98; 1.00
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	Pressure ulcers	0.98	0.98; 0.99
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	Pressure ulcers	0.99	0.97; 1.02
Cho[38]	Administrative	Hospital	232	Combined	Medical	Pressure ulcers	1.00	0.96; 1.03
Kovner[35]	Administrative	Hospital	5,708	Surgical	Surgical	Pressure ulcers	0.87	0.75; 1.02
Needleman[29]	Administrative	Hospital	799	Combined	Surgical	Pressure ulcers	1.04	0.99; 1.10
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	SWI	1.00	0.99; 1.02
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	SWI	1.02	1.01; 1.03
Cho[38]	Administrative	Hospital	232	Combined	Surgical	SWI	0.97	0.91; 1.04
Needleman[28]	Administrative	Hospital	4,156	Medical	Medical	DVT	1.01	0.99; 1.03
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	DVT	1.03	1.00; 1.06
Needleman[28]	Administrative	Hospital	3,357	Medical	Medical	DVT	1.00	0.99; 1.01
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	DVT	1.00	0.99; 1.01
Needleman[28]	Administrative	Hospital	256	Medical	Medical	DVT	1.00	0.98; 1.03
Needleman[28]	Administrative	Hospital	256	Medical	Medical	DVT	1.02	0.98; 1.06
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	DVT	1.07	1.03; 1.11
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	DVT	1.11	1.05; 1.17
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	Complications	0.96	0.68; 1.35
Needleman[28]	Administrative	Hospital	3,357	Medical	Medical	Complications	1.01	1.00; 1.02
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	Complications	1.10	1.03; 1.19
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Complications	1.02	0.98; 1.05
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Complications	1.05	1.00; 1.10
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	Complications	1.04	0.98; 1.10
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	Complications	1.10	1.02; 1.19
Berney[84]	Administrative	Hospital	161	Medical	Medical	Sepsis	0.96	0.94; 0.98
Berney[84]	Administrative	Hospital	161	Surgical	Surgical	Sepsis	0.97	0.95; 0.99

Table G15. Relative risk of patient outcomes corresponding to an increase by 1 RN hour/patient day as reported by authors (continued)

Author	Data	Analytic Unit	Hospitals	Units	Patients	Outcomes	Relative Risk	95% CI
Needleman[28]	Administrative	Hospital	4,156	Medical	Medical	Sepsis	1.04	1.01; 1.08
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	Sepsis	1.01	0.98; 1.03
Needleman[28]	Administrative	Hospital	3,357	Medical	Medical	Sepsis	1.00	0.99; 1.01
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	Sepsis	0.99	0.98; 0.99
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Sepsis	1.01	0.99; 1.04
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Sepsis	1.02	0.98; 1.05
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	Sepsis	1.01	0.98; 1.04
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	Sepsis	1.03	0.98; 1.08
Cho[38]	Administrative	Hospital	232	Combined	Medical	Sepsis	1.02	0.95; 1.09

DVT = Deep vein thrombosis; GIB = Gastrointestinal bleeding; SWI = Surgical wound infection; UTI = Urinary tract infection

Table G16. Patient outcomes corresponding to an increase by 1 LPN hour/patient day (effects reported by authors and calculated from published results, more studies contributed to pooled analysis)

Studies	Outcomes	Measure	Effect	Significance
Zidek[85]	Pressure ulcers	Rate		NS
Zidek[85]	Falls	Rate		NS
Tallier[83]	Pressure ulcers	Rate*		NS
Tallier[83]	Urinary tract infection	Rate*		NS
Stratton[91]	Nosocomial Infection	Rate*		NS
Bolton[26]	Pressure ulcers	Rate*		NS
Bolton[26]	Falls	Rate*		NS
Kovner[35]	Deep vein thrombosis	Rate	-0.31	0.003
Kovner[35]	Pulmonary failure	Rate	-1.23	0.002
Kovner[35]	Pneumonia	Rate	-1.69	0.002
Kovner[35]	Urinary tract infection	Rate		NS
Langemo[41]	Pressure ulcers	Rate		NS
Mark[89]	Pneumonia	Relative risk	0.13	0.004
Mark[89]	Urinary tract infection	Relative risk		NS
Needleman[28]	Sepsis	Rate		NS
Needleman[28]	Gastrointestinal bleeding	Rate		NS
Needleman[28]	Pressure ulcers	Rate		NS
Needleman[28]	Surgical wound infection	Rate		NS
Needleman[28]	Surgical wound infection	Relative risk		NS
Needleman[28]	Deep vein thrombosis	Rate		NS
Needleman[28]	Pulmonary failure	Rate		NS
Needleman[28]	Pneumonia	Rate	1.07	0.015
Needleman[28]	Urinary tract infection	Rate		NS
Needleman[28]	Failure to rescue	Rate		NS

NS = Not significant
* Rate per 100 patient days

Table G17. Patient outcomes corresponding to an increase by 1 unlicensed assistive personnel hour/patient day (effects reported by authors and calculated from published results, more studies contributed to pooled analysis)

Studies	Outcomes	Measure	Effect	Significance
Needleman[28]	Shock	Rate		NS
Needleman[28]	Gastrointestinal bleeding	Rate		NS
Ritter-Teitel[69]	Pressure ulcers	Rate		NS
Zidek[85]	Pressure ulcers	Rate		NS
Tallier[83]	Pressure ulcers	Rate*		NS
Sovie[71]	Pressure ulcers	Rate		NS
Needleman[28]	Pressure ulcers	Rate		NS
Needleman[28]	Surgical wound infection	Rate		NS
Needleman[28]	Surgical wound infection	Relative risk		NS
Cimiotti[87]	Nosocomial infection	rate		NS
Stratton[91]	Nosocomial infection	Rate*		NS
Needleman[28]	Deep vein thrombosis	Rate		NS
Needleman[28]	Pulmonary failure	Rate		NS
Needleman[28]	Pneumonia	Rate		NS
Cimiotti[87]	Pneumonia	Rate		NS
Ritter-Teitel[69]	Urinary tract infection	Rate	1.58	0.0001
Tallier[83]	Urinary tract infection	Rate*		NS
Sovie[71]	Urinary tract infection	Rate		NS
Needleman[28]	Urinary tract infection	Rate		NS
Needleman[28]	Failure to rescue	Rate		NS
Ritter-Teitel[69]	Falls	Rate		NS
Zidek[85]	Falls	Rate		NS
Sovie[71]	Falls	Rate		NS

NS = Not significant
* Rate per 100 patient days

Table G18. Evidence of the association between nurse education and experience and patient outcomes

Author, Definition of Patient Outcomes, Definition of Nurse Education and Experience	Number of hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Education and Experience Categories	Patient Outcomes
Aiken[39] Failure to rescue: deaths within 30 days of admission among patients who experienced complications, Complications: the secondary diagnosis distinguished from preexisting co morbidities, Highest credential in nursing: a hospital school diploma, an associate degree, a bachelor's degree, a master's degree, or another degree; the mean number of years of experience working as an RN for nurses from each hospital	Hospitals 168 Unit ICU Patients Surgical	60% of hospital workforce with BSN or higher, 8 patients/day 40% of hospital workforce with BSN or higher, 4 patient/nurse 20% of hospital workforce with BSN or higher, 4 patients/nurse 60% of hospital workforce with BSN or higher, 6 patients/nurse 40% of hospital workforce with BSN or higher, 6 patients/nurse 20% of hospital workforce with BSN or higher, 6 patients/nurse 60% of hospital workforce with BSN or higher, 4 patients/nurse 20-29% of hospital workforce with BSN or higher, experience 14.4 years <20% of hospital workforce with BSN or higher, 14.9 years 20% of hospital workforce with BSN or higher, 8 patients/nurse >50% of hospital workforce with BSN or higher, experience 12.5 years 40-49% of hospital workforce with BSN or higher, experience 14.3 years 30-39% of hospital workforce with BSN or higher, experience 14.0 years 40% of hospital workforce with BSN or higher 20-29% of hospital workforce with BSN or higher, experience 14.4 years <20% of hospital workforce with BSN or higher, 14.9 years >50% of hospital workforce with BSN or higher, experience 12.5 years 40-49% of hospital workforce with BSN or higher, experience 14.3 years 30-39% of hospital workforce with BSN or	Falls, rate % 8.47 7.84 8.54 7.80 8.50 9.26 7.18 9.40 10.20 10.02 6.90 8.60 8.00 9.22 Complications 22.90 22.90 25.20 22.00 22.80

Table G18. Evidence of the association between nurse education and experience and patient outcomes (continued)

Author, Definition of Patient Outcomes, Definition of Nurse Education and Experience	Number of hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Education and Experience Categories	Patient Outcomes
		higher, experience 14.0 years Increase by 1 year in nurse experience 10% increase in nurses with BSN degree	 Failure to rescue 1.01 0.96 1.03 0.95 0.91 0.99
Blegen[73] The number of patient falls on the unit in quarter/1,000patient days, The proportion of RNs on the unit with BSN education, the proportion of RNs on the unit with more than 5 years experience or the average years of nursing experience of RNs on the unit	Hospitals 11 Unit Combined Patients Combined	 Increase by 1 year in RN experience in unit Increase by 1% in proportion of RN with BSN Increase by 1% in proportion of RN with BSN Increase by 1% in proportion of RN with experience >5 years Nurse hours RN hours % BSN 10.7 7.704 47.00	Falls, rate per 100 patien days -0.04 0.01 -0.01 -0.01 0.27 ± 0.28
Langemo[33] Any lesion which is caused by unrelieved pressure that results in damage to underlying tissues, unplanned descent to the floor recorded in incidence reports	Hospitals 6 Unit ICU Patients Medical Age 61.9 Sex 41	Nurse hours RN hours % BSN Experience 10.9 5.42 59.5 11.0	Pressure ulcers, rate % 8.6
Marcin[3] Extubation – displacement of the endotracheal tube from the trachea by either the patient (self-extubation) or unplanned by medical personnel (e.g., when positioning a patient for a radiograph or procedure), The number of years of clinical experience in the PICU calculated from the time of starting work in the PICU to the middle of the study period	Hospitals 1 Unit ICU Patients Combined Age 3.3	 1:2 nurse/patient ratio, experience 7.8 years 1:1 nurse/patient ratio, experience 7.0 years 7.8 years of nurse experience in ICU 7 years of nurse experience in ICU	Relative risk 4.24 1.00 19.10 1.00 1.00 1.00 1.02 0.96 1.08 1.00 1.00 1.00
Mark[80] Number of incidents per 1,000 acuity-adjusted patient days; average highest educational level attained by nurses on the unit; the average years of experience in nursing for nurses on the unit	Hospitals 64 Unit Combined Patients Medical	% RN % BSN 58 21.00	Falls, rate % ± SD 0.75 ± 0.09

Table G18. Evidence of the association between nurse education and experience and patient outcomes (continued)

Author, Definition of Patient Outcomes, Definition of Nurse Education and Experience	Number of hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Education and Experience Categories			Patient Outcomes
Sovie[71]	Hospitals 29		BS	Years	UTI, rate % ± SD
Nosocomial urinary tract infection (not present at admission or within 72 hours after); the number of infections / number of patients discharged * 100 at hospital level; any fall or slip in which a patient came to rest unintentionally on the floor; the ratio of the number of falls in a unit (or area) to the number of patient days * 1,000; % of nurses with BSN; nursing experience in years	Unit Combined	1997	53.00	10.9	2.64 ± 1.67
	Patients Combined	1998	52.70	11.2	2.02 ± 1.43
	Medical units	1997	53.00	10.9	2.17 ± 2.49
	Medical units	1998	52.70	11.2	2.61 ± 2.56
	Surgical units	1997	53.00	10.9	1.87 ± 2.29
	Surgical units	1998	52.70	11.2	2.45 ± 2.24
			BS	Years	Falls, rate % ± SD
	Medical units	1997	53.00	10.9	2.88 ± 1.20
	Medical units	1998	52.70	11.2	2.95 ± 0.91
	Surgical units	1997	53.00	10.9	3.97 ± 2.10
	Surgical units	1998	52.70	11.2	4.11 ± 1.68
			53.00	10.9	2.42 ± 1.41
			52.70	11.2	2.69 ± 1.19
			BS	Years	Pressure ulcers, rate % ± SD
		1997	53.00	10.9	3.53 ± 1.82
		1998	52.70	11.2	3.14 ± 2.63
	Medical units	1997	53.00	10.9	2.61 ± 2.56
	Medical units	1998	52.70	11.2	2.23 ± 1.94
	Surgical units	1997	53.00	10.9	2.68 ± 2.22
	Surgical units	1998	52.70	11.2	1.88 ± 1.33

BSN = Bachelor of Science in Nursing' ICU = Intensive Care Unit; PICU = Pediatric Intensive Car Unit; RN = Registered Nurse; SD = Standard Deviation

Table G19. The association between nurse characteristics and patient outcomes

Author, Definition of Nurse Characteristics and Patient Outcomes	Unit, Number of Nurses, % of Whites, % of Females	Nurse Categories	Patient Outcomes
Aiken[4] Patient survey; patients satisfaction with nurse care in unit, nurses survey; burnout scale not reported on the article, nurses autonomy subscale		% of reported Burnout Adequate autonomy 26.73 70.8 21.48 75.45 21.9 84.8	Patient satisfaction with nursing care Scores ± SD 60.06 ± 8.09 64.41 ± 8.18 67.85 ± 9.08
Dugan[17] Incident reports; the number of reported patient falls occurred monthly during the study period; nurses survey to measure stress: a manifestation, evidences by behavioral, physical, and personal changes that were perceived by staff nurses and measured by the Stress Contunuum Scale (10 max stress) and Stress Survey Scores (max 268)	Unit Nurses Combined 293	% reported stress 20 45.5 53 58 63 68 85.5	Falls, rate % 0.6 1 1.1 1.6 1.8 2.1 2.2
Estabrooks[50] Hospital Inpatient Database, Alberta Health Care Insurance Plan Registry (AHCIPR) was linked to identify persons who died within 30 days of admission. Survey of RN (Alberta Association of Registered Nurses registry) working in acute care hospitals. Reponses for the Q "On the whole, how satisfied are you with your job?": 1. very dissatisfied; 2. a little dissatisfied; 3. moderately satisfied; 4. very satisfied); Q." Freedom to make important patient care and work decisions". Responses:1. Strongly disagree; 2. Somewhat disagree; 3. Somewhat agree; 4. strongly agree	Unit Combined Nurses 4,799	% satisfied % adequate autonomy 60.125 77.5 55.375 69.25	Relative risk of death, 95% CI 1 1 1 0.85 0.47 1.55 1 1 1 0.79 0.37 1.66

Table G19. The association between nurse characteristics and patient outcomes (continued)

Author, Definition of Nurse Characteristics and Patient Outcomes	Unit, Number of Nurses, % of Whites, % of Females	Nurse Categories	Patient Outcomes
Halm[51] The hospital's data warehouse with patient's discharges; deaths within 30 days of admission, death following complications within 30 days). Survey of 140 staff nurses (42% response rate); Maslach Burnout Inventory Manual (max 6 scores) with 3 subscales of burnout: emotional exhaustion; depersonalization; personal accomplishment (feelings of competence and successful achievement in one's work), overall rating on a simple 4-point Likert scale, ranging from 1 (very dissatisfied) to 4 (very satisfied) and the likelihood to leave current position within the next 12 months, the 22-item Human Services Survey from the Maslach Burnout Inventory Manual to measure emotional exhaustion	Unit Surgical Nurses 140 % females 96.4	% Burnout % Satisfied % Stress 25 70 25	Death rate % 1.2

Table G19. The association between nurse characteristics and patient outcomes (continued)

Author, Definition of Nurse Characteristics and Patient Outcomes	Unit, Number of Nurses, % of Whites, % of Females	Nurse Categories	Patient Outcomes
Mark[80] The hospital's incident reporting system and patient survey; total patient days divided by the number of discharges. Patients' satisfaction with nursing care; perceptions of the courtesy of the nursing staff; the ability of the doctors, nurses, and other staff to work together; their satisfaction with pain relief; and their level of comfort sharing concerns with nurses. Number of falls per 1,000 acuity-adjusted patient days. Administrative hospital data, nursing survey. Turnover as a ratio of the number of nurses who left during the period divided by the number of nurses employed at the end of the year; global satisfaction in the job (alpha = .84, a single factor explained 68% of the variance). Adequacy - the extent to which nurses on the unit felt free to engage in activities such as consulting with others about complex care problems, influencing standards of care, and acting on their own decisions related to caregiving. Availability of support services was evaluated with a 27-item, 3-point checklist 24 in which staff nurses (n = 1,682) indicated whether a variety of support services was available, not available, or inconsistently available (alpha =.85)	Unit Medical Nurses 1,682	Turnover Satisfaction Adequacy 17 54.25 47 Support Coordination Autonomy 50 50.33 73.2	Length of stay, days ± SD 5.31 ± 1.47 % if satisfied with nurse care ± SD 78.33 ± 7.5 Falls, rate/100 patient days ± SD 0.12 ± 0.09

Table G19. The association between nurse characteristics and patient outcomes (continued)

Author, Definition of Nurse Characteristics and Patient Outcomes	Unit, Number of Nurses, % of Whites, % of Females	Nurse Categories	Patient Outcomes
Minnick[19] Patient survey with interviews within 26 days of hospital discharge using the Computer-Assisted Telephone Interview (CATI) system, reports about assistance with pain management. Unit labor quantity data and nurses survey: Manager's Ability to Involve Staff in Practice Self-Governance. This variable is the average of the unit's RNs' rating (on a 5 point scale with 5 as most favorable) of the manager's ability to involve staff in setting patient care standards; the pay (score range 6-42), professional status (score 7-49), and task requirement attitude (score 6-42) scales (Stamps and Piedmonte) and the benefit (3 score 3-21) and schedule (score 4-28) scales (Minnick and Roberts); Central Hospital Support Systems Adequacy-the average of a RNs' ratings (on a 1 to 5 scale with 1 as least favorable) of hospital-wide support systems		Increase in nurse job satisfaction by 10 scores	Patient satisfaction with pain management Relative risk 1.22
Ridge[25] Patient survey 2 weeks after discharge with computerized phone interview system; length of stay in hospital; patient satisfaction measured with Likert-type 5 points scale from strongly disagree to agree for overall nursing care, pain management, overall hospital care. Hospital administrative database, finance reports, HCIA database, unit nurse manager reports; turnover - number of individual staff hired annually/total number of staff; staffing adequacy - RN worked hours/RN target hours	Unit Surgical Nurses 22 % Females 92	% Turnover 23.2 % Turnover 23.2 % Vacancy 9 % Turnover 23.2 % Vacancy 9	Length of stay, days ± SD 4.1 ± 3.9 % satisfied with nurse care 88 87.2 % satisfied with pain management 83.6 ± 16.6 83.2 ± 3.828

Table G19. The association between nurse characteristics and patient outcomes (continued)

Author, Definition of Nurse Characteristics and Patient Outcomes	Unit, Number of Nurses, % of Whites, % of Females	Nurse Categories	Patient Outcomes
Seago[8] Hospital incidence reports database at three time periods: time 1-third quarter fiscal year 1996 (FY96); time 2-second quarter fiscal year 1997 (FY97); and time 3-third quarter fiscal year 1997 (FY97) in three different cross-sections of patients, Patient satisfaction measured with Likert scale; the proportion of pressure ulcers per patient day; the proportion of falls per patient day. The nursing staffing system (ANSOS) and nursing survey at three time periods: time 1-third quarter fiscal year 1996 (FY96); time 2-second quarter fiscal year 1997 (FY97); and time 3-third quarter fiscal year 1997 (FY97).		% satisfied Coordination Autonomy 71 94.40 69 62.13 93.60 59 62.13 92.20 % satisfied Coordination Autonomy 71 94.40 69 62.13 93.60 59 62.13 92.20	Relative risk of pressure ulcer Not significant Falls Pressure ulcer 0.29 0.24 0.27 0.18 0.23 0.29
Sochalski[45] MedPAR dataset of hospital discharges; reported by RN frequency of medication errors and patients falls from “never in the past year” (score 1) to “occur frequently” (score 10). survey of RNs, the survey question “In general, how would you describe the quality of nursing care delivered to patients your unit on your last shift?,” and for which a 4-category response was available (poor, fair, good, excellent)	Unit Combined Nurses 8,670	Perceived quality of care, % satisfied 10 20 30 40	Adverse events Relative risk, 95% 1.00 1.00 1.00 0.92 0.91 0.92 0.88 0.87 0.88 0.84 0.84 0.85

Table G19. The association between nurse characteristics and patient outcomes (continued)

Author, Definition of Nurse Characteristics and Patient Outcomes	Unit, Number of Nurses, % of Whites, % of Females	Nurse Categories	Patient Outcomes
Sovie[71] Incident reports, patient survey 4 years after restructuring and reengineering in hospitals. The Picker Institute Patient Satisfaction Survey; the Press, Ganey Patient Satisfaction Survey. Dimensions: Pain management; Education; Attention to needs; Nursing care; Preparation for discharge. Nosocomial (not present at admission or within 72 hours after); the number of infections / number of patients discharged * 100 at hospital level; any fall or slip in which a patient came to rest unintentionally on the floor; the ratio of the number of falls in a unit (or area) to the number of patient days * 1,000. the MECON-PEERx Operations Benchmarking Database Reports; the office of the chief nurse executives; nursing survey; achieving quality patient outcomes; ranged from 1 = strongly disagree to 5 = strongly agree	Unit / Nurses / Age / Sex / Race Medical 347 36.9 92.8 79.6 Medical 298 36.7 92.3 82.4 Surgical 289 36.9 92.8 79.6 Surgical 239 36.7 92.3 82.4	Management / Quality / Autonomy 66.8 74.4 47 66.8 72 47.25 65.6 74 49 65.6 72.2 49.25 Management / Quality / Autonomy 66.8 74.4 47 66.8 72 47.25 65.6 74 49 65.6 72.2 49.25	% satisfied with nurse care ± SD 83.6 ± 5.89 83.32 ± 5.67 82.82 ± 6.54 84.9 ± 6.99 % satisfied with pain management ± SD 83.04 ± 9.92 83.31 ± 7.82 85.55 ± 6.77 85.92 ± 4.63
Vahey[44] Conducted cross-sectional surveys of patients (621) satisfaction with nursing care using the La Monica-Oberst Patient Satisfaction Scale (LOPSS), 4 points scale. Conducted cross-sectional surveys of nurses (N=820) with the Maslach Burnout Inventory (MBI);7 point scales, staffing adequacy , administrative support, 4 scores, emotional exhaustion, 7 point scales	Unit Specialized Nurses 621 Age 34.6 Sex 7.4 Race 48.8	Burnout / Support / Stress 80 20 20 Support 80 Burnout 20 Stress 80	Patient satisfaction, relative risk Reference 1.49 1.06 2.09 2.37 1.37 4.12 0.51 0.3 0.87

Table G19. The association between nurse characteristics and patient outcomes (continued)

Author, Definition of Nurse Characteristics and Patient Outcomes	Unit, Number of Nurses, % of Whites, % of Females	Nurse Categories	Patient Outcomes
Zidek[85] Patient records and chart audits, individuals length of stay in the hospital, new incidence of skin breakdown acquired over the course of the hospital stay, number of reported unplanned descent to the floor during the course of the hospital stay, administrative records, quarterly turnover rate in %	Unit Combined Nurses 1,759	Turnover % 10.67 12.04 13.16	Rate, % Falls Pressure ulcers 2.79 0.68 1.58 0.67 2.95 0.72

CI = Confidence Interval; RN = Registered Nurse; SD = Standard Deviation

Table G20. The evidence of the association between nurse staffing and patient satisfaction

Author, Measure of Patient Satisfaction	Sample Size, Unit, Patients	Nurse Categories	Patient Satisfaction
Aiken[5] Twenty-one item scale based in part on the LaMonica/Oberst Patient Satisfaction Scale (LOPSS)	Size 1,205 Unit Combined Patients Medical	 Increase by 1 RN Nurse control over practice setting Dedicated AIDS units AIDS hosp-scattered bed units Conventional scattered bed units	**Relative risk of being satisfied** 3.0 0.0 343.8 1.4 1.4 2.5 3.6 0.3 41.3 0.1 0.0 2.0 1.0 1.0 1.0
Aiken[4] Patients satisfaction with nurse care in unit	Size 1,205 Unit Spec Patients Medical	Conventional general medical unit, Non-magnet hospital Specialized AIDS unit, non-magnet hospital General medical unit, magnet hospital	% satisfied Scores ± SD 74% 7.42 ± 2.3 83% 8.29 ± 1.7 85% 8.53 ± 1.9
Barkell[77] Patient satisfaction: the patient's perception of pain, and the frequency of documentation of pain scores measured by scores on the Parkside Patient Satisfaction Survey	Size 96 Unit Surgical Patients Surgical	 Team nursing model with UAP assisting RNs in delivery of patient care (lower proportion of RN = 65.7%) Total patient care model (higher proportion of RNs = 78.5%)	% Satisfied ± SD 83.4 ± 13 84.6± 13
Blegen[59] The number of patient complaints standardized as a rate per 1,000 patient days.	Size 42 Unit Combined Patients Combined	 Increase by 1% in proportion of RNs Proportion of RNs >87.5% Increase by 1 hour in total nursing hours 10.74 nurse hours/patient day	Rate of complains/100 patient days ± SD 0.46 ± 1.85 0.04 ± 0.07 0.02 ± 0.60 0.22
Bolton[42] The standardized Picker Institute inpatient questionnaire including respect patients' values and preferences, coordination of care; information and education; pain management; emotional support, and transition and continuity to the home or community	Size 113 Unit Combined Patients Combined	Nurse hours/patient day 7.9 hours RN hours/patient day 4.4 hours % RN 56%	% Satisfied with nurse care ± SD 86 ± 5%

Table G20. The evidence of the association between nurse staffing and patient satisfaction (continued)

Author, Measure of Patient Satisfaction	Sample Size, Unit, Patients	Nurse Categories	Patient Satisfaction
Langemo[33] Patient's satisfaction with nursing care and opinions of overall hospital care, pain management, and education from 42-item Patient Opinions of Nursing Care Survey	Size 942 Unit ICU Patients Medical	Nurse Hours/patient day 10.9 RN hours/patient day 5.42 % BSN 59.5	Score for satisfaction with pain management 0.913
Mark[80] Patients' satisfaction with nursing care; perceptions of the courtesy of the nursing staff; ability of the doctors, nurses, and other staff to work together; their satisfaction with pain relief; and their level of comfort sharing concerns with nurses	Size 1,326 Unit Combined Patients Medical	% RN 58 % BSN 21.00	% Satisfied with care 78.33% Score of satisfaction with nurse care ± SD 4.7 ± 0.45
Minnick[19] Reports about assistance with pain management; patient teaching was defined as reports of instruction that patients received about signs and symptoms that needed attention after hospital discharge	Size 2,051 Unit Medical Patients Medical	Patient satisfaction in units with >54% of RN with BSN vs. lower % of RN with BSN	Relative risk of being satisfied with care – 1.48 Relative risk of being satisfied with pain management - Not significant
Potter[40] Eight Visual Analog Scale and post discharge (48 hour) satisfaction with seven satisfaction measures including communication, respect, coordination of care, nursing care, discharge process, advocating, and patient compassionate care (5 point Likert scale)	Size 32 Unit ICU Patients Medical	Nurse hours/patient day % RN 3.1 53.8 2.9 55.4 3 56.2 3.1 57.1	% Satisfied with nurse care 75.4 74.2 77.3 75.6

Table G20. The evidence of the association between nurse staffing and patient satisfaction (continued)

Author, Measure of Patient Satisfaction	Sample Size, Unit, Patients	Nurse Categories	Patient Satisfaction
Ridge[25] Likert-type 5-point scale from strongly disagree to agree for overall nursing care, pain management, and overall hospital care	Size 1,076 Unit Surgical Patients Surgical	% BSN Experience 44 8.70 Nurse hours/patient day % RN 6.9 67 Increase by 1 hour in LPN hours Increase by 1% in RN % BSN Experience 44 8.70 Nurse hours/patient day % RN 6.9 67 % BSN Experience 44 8.70 Nurse hours/patient day % RN 6.9 67	Satisfaction with nurse are ± SD 4.3 ± 0.76 4.29 ± 0.14 0.65 0.893 % satisfied 88% 87.2% % satisfied with pain management 84 ± 7 83 ± 3.8
Ritter-Teitel[69] satisfaction with nursing care and pain management during hospital stay (max 100 scores)	Size 56 Unit Combined Patients Combined	Nurse hours/patient day % RN 9.3 56.15 9.58 56.4 9.19 56.79 9.79 56.77 9.41 56.79 9.36 56.77 Increase by 1 hour in RN hours Nurse hours/patient day % RN 9.3 56.15 9.58 56.4 9.19 56.79 9.79 56.77 9.41 56.79 9.36 56.77 Increase by 1 hour in RN hours	% satisfied with nurse care ± SD 82.68 ± 6.08% 84.38 ± 6.31% 83.29 ± 6.08% 83.82 ± 5.67% 82.08 ± 6.31% 84.9 ± 6.99% 1.18 ± 4.17% % satisfied with pain management 84.1 ± 8.73% 84.6 ± 6.46% 83.1 ± 10.2% 83.3 ± 7.82% 85.3 ± 6.87% 85.9 ± 4.63% 1.50 ± 4.08%
Seago[8] Patient satisfaction measured with Likert scale	Size 89,256 Unit Combined Patients Medical	Patient focused care % RN Before 63 After 61.5 After 62	Relative risk of being satisfied with nurse care Not significant Not significant Not significant

Table G20. The evidence of the association between nurse staffing and patient satisfaction (continued)

Author, Measure of Patient Satisfaction	Sample Size, Unit, Patients	Nurse Categories	Patient Satisfaction
Seago[93] Patient satisfaction measured with Likert scale	Size 1,012 Unit Combined Patients Medical	Nurse hour %RN 8.1 75 8.3 96 7.49 72 Increase by 1 nurse hour Increase by 1% in RN Increase by 1 RN hour	% satisfied with pain management ± SD 84.2 ± 3.5% 89.3 ± 6.4% 80.5 ± 6.7% 2.44 ± 0.62 13.6 ± 3.6 2 ± 2
Sovie[71] The Picker Institute Patient Satisfaction Survey; the Press, Ganey Patient Satisfaction Survey. Dimensions: pain management, education, Attention to needs, nursing care, preparation for discharge	Size 29 Unit Combined Patients Medical Medical Surgical	Nurse hour UAP hour % BSN 9.14 2.39 53.00 9.79 2.7 52.70 9.34 2.22 53.00 9.36 2.56 52.70 Increase by 1 RN hour Nurse hour UAP hour % BSN 9.14 2.39 53.00 9.79 2.7 52.70 9.34 2.22 53.00 9.36 2.56 52.70 Increase by 1 nurse hour Increase by 1 nurse hour	% satisfied with nurse care ± SD 84 ± 5.9% 84 ± 5.7% 83 ± 6.5% 85 ± 7% 2.87 % satisfied with pain management 83.04 ± 9.962 83.31 ± 7.862 85.55 ± 6.862 85.92 ± 4.662 -2.3 ± 1 -1.4 ± 0.3
Tallier[83] Patient opinion of care in hospital measured with Patient Satisfaction Survey (max 27 scores)	Size 2,897 Unit Combined Patients Medical	Nurse hours % RN 5.8 57 5.7 60 Nurse hours RN hours 6.2 5.9 5.8 5.9 5.8 5.5 5.7 6.9 5.3 6.6 6.1 6.8	% satisfied 72% 72% 72% 72% 72% 77% 77% 77%

RN = registered nurse; UAP = unlicensed assistive personnel; BSN = Bachelor of Science in Nursing; SD = Standard deviation

Table G21. Research studies related to staffing ratios/hours/skill mix in acute care hospitals (not included in questions 1, 2, and 4)

Author, Year, Publication Type	Aim of the Study	Sample	Study Design and Method	Variables	Results
Systematic reviews					
Lankshear [96]	Assesses the evidence for a relationship between the nursing workforce and patient outcomes in acute hospitals through a systematic review of the literature	22 international studies between 1990 and 2004	Systematic review of literature	Nurse staffing Patient outcomes	22 studies relating nurse staffing to mortality, failure to rescue, and 7 common complications. Concluded that there is support that higher nurse staffing and RN skill mix are associated with improved patient outcomes. Noted that the effect size could not be estimated reliably. The association between nurse staffing and patient outcomes appears to show diminishing marginal returns.
Lang[97]	Determine if peer-reviewed literature supports minimum nurse-patient ratios for acute care hospitals and whether nurse staffing is associated with patient, nurse employee, and hospital outcomes	43 studies between 1980 and 2003	Systematic review of literature	Nurse staffing Patient, nurse employee, and hospital outcomes	43 studies relating nurse staffing to in-hospital adverse events (failure to rescue, inpatient mortality, pneumonia, urinary tract infection, pressure ulcers, shock); nurse outcomes (needle stick injuries, nurse burnout, nurse documentation, nurse satisfaction, absenteeism, assaults, and nurse professionalism), hospital outcomes (length of stay, financial outcomes, staffing models). Concluded there is probable relationships between nurse staffing and failure to rescue among surgical patients, inpatient mortality; limited evidence between nurse staffing and burnout, needle stick injuries, nurse documentation, hospital financial outcomes; statistically and clinically significant relationship between nurse staffing and length of stay. No support in the literature for specific, minimum nurse-patient ratios, especially in the absence of adjustments for skill and patient mix.

Table G21. Research studies related to staffing ratios/hours/skill mix in acute care hospitals (not included in questions 1, 2, and 4) (continued)

Author, Year, Publication Type	Aim of the Study	Sample	Study Design and Method	Variables	Results
Externally imposed staffing policies (mandated patient ratios)					
Seago[98]	Examine the relationship between nurse staffing and owner type or specific corporate entity	Short-term general hospitals that reported in the California Office of Statewide Health Planning and Development's (OSHPD) Hospital Disclosure report from 1997-1999	Descriptive cross-sectional design. Secondary data analysis using data from the California OSHPD Hospital Disclosure report (1997-1998).	RN hours/patient day, RN-to-patient ratio, RN skill mix. LVN, aide, and total hours/patient day, patient days, discharges, RN/LPN/NA wages, percent Medicaid, Medicare case mix, length of stay, technology index, rural/urban location, proprietary status for hospital and system	For profit hospitals and system had fewer RN productive hours for medical-surgical nursing, but when distinguished by rural or urban location, the relationship is no longer significant. The lower use of RNs in for profit systems is likely driven by one health system. More RN productive hours is predicted by more patient days, higher case mix index and higher technology scores.
Donaldson[9]	Examine the impact of mandated nurse-to-patient ratios on unit-level nurse staffing, the incidence and patient outcomes	California hospitals participating in the California Nursing Outcomes Coalition (CalNOC) N = 68 hospitals and 268 patient care units	Descriptive, pre-post design CalNOC data collected at the point of service in real time by hospitals using current staffing data as well as the three patient outcomes. Pre-ratio baseline: first 6 months (2 quarters) of 2002 Post-ratio period: first 6 months (2 quarters) of 2004 following implementation of the licensed nurse-to-patient ratios	Nursing-care hours (RN, LVN, unlicensed productive hours); RN nursing care hours; LVN nursing care hours; non-RN and LVN caregiver care hours; contracted hours; skill mix; total patient days; patient falls incidence; hospital acquired pressure ulcer prevalence.	Mean total RN hours of care per patient day increased by 20.85 on medical-surgical units after implementation of mandated staffing ratios; total nursing hours increased by 7.4%. Number of patients per licensed nurse decreased post-implementation by 16% and the number of patients per RN decreased by 17.5%. No changes noted to step-down units; no changes in use of contract nurses. Changes were consistent across hospital size and hospital systems. There was no statistically significant change in the incidence of falls or the prevalence of hospital acquired pressure ulcers following implementation of the nurse-patient mandated ratios.

Table G21. Research studies related to staffing ratios/hours/skill mix in acute care hospitals (not included in questions 1, 2, and 4) (continued)

Author, Year, Publication Type	Aim of the Study	Sample	Study Design and Method	Variables	Results
Hodge[99]	Develop baseline data on the characteristics, number, and distribution of licensed caregivers in specific units of acute care hospitals in California and determine how staffing varies across different types of acute care hospitals.	Stratified random sample of general acute care hospitals in California. N = 80 hospitals; 2,298 nurses	Cross-sectional descriptive design. Investigator developed survey instrument which was administered by RN surveyors. Data collected from hospital administrators, nurse managers, direct care staff nurses.	Unit-related data: Duration of shifts, type of shifts, number of patients, nurses, unlicensed staff, admissions, discharges, patient care assignments, services provided by licensed nurses; experience, education, employment status and patient load of each nurse on duty on day of survey; staffing and skill mix data for all shift.	Diverse nursing staffs are present in California hospitals (e.g. education, experience, employment status). 50% of RNs on day shift have a baccalaureate degree. The proportion of RNs varied by type of unit ranging from 30% (subacute) to 84% (postpartum/delivery). Per diem and agency staff comprise more than 20% of the day shift staff for emergency departments and post-partum units. Nurses in academic medical centers and rural hospitals generally had fewer patients than did nurses in other hospital types.
Studies with implications for staffing policies that were ineligible for meta-analysis					
McGillis Hall[100]	Evaluate the impact of different nurse staffing models selected patient outcomes.	19 teaching hospitals in Ontario, Canada using adult medical-surgical and obstetric inpatients. N at admission: = 2,046 N at discharge = 1,811 N at 6 weeks post discharge = 1,483	Repeated measure design Data collected from patients using a variety of instruments and data also collected by data collectors. Staffing data provided by nurse managers. Patient data collected at admission, discharge, and 6 weeks after discharge.	Functional health outcomes (Functional Independence Measure; SF-36); Pain (Brief Pain Inventory Short Form); Patient perception of nursing care (Patient Judgment of Hospital Quality Questionnaire); Mix of staff on patient care units Continuity of patient care assignments	A higher proportion of regulated nursing staff (Canadian term for RN) was associated with better FIM scores and better social function scores at hospital discharge. Nursing staff mix (higher proportion of RN/RPNs) was a significant predictor of functional independence, pain, social functioning, and patient satisfaction with obstetric care, after other potential determinants of health outcomes were controlled.

Table G21. Research studies related to staffing ratios/hours/skill mix in acute care hospitals (not included in questions 1, 2, and 4) (continued)

Author, Year, Publication Type	Aim of the Study	Sample	Study Design and Method	Variables	Results
McGillis Hall[101]	Determine if nurse staffing models and nursing demographic variables explain variation in quality outcomes. Determine if the influence of the nurse staffing model on the quality outcomes varies by type of care delivery model.	77 adult medical, surgical and obstetrical patient care units in 19 urban teaching hospitals in Ontario, Canada. 1,116 nurses	Descriptive correlational design Nurse staffing data collected through questionnaires to unit managers; Surveys distributed to RNs	Nurse staff mix; Nursing care delivery models (total patient care, team nursing, primary nursing); Nurses' perceptions of quality of care; Unit communication and coordination.	There was a significant positive relationship between all nursing staff models with an all-RN staff and nurses' perceptions of quality of care. A staff mix of RNs and RPNs had a statistically significant negative influence on the use of individualized approaches for the coordination of care and overall unit communication, whereas the opposite was true for staff models that had both regulated and unregulated workers (RNs, RPNs, and URWs).
McGillis Hall[101]	Examine the effect of different nurse staffing models on costs and patient outcomes.	77 adult medical, surgical and obstetrical patient care units in 19 urban teaching hospitals in Ontario, Canada.	Descriptive correlational design	Four types of nursing staff mix (RN and RPN; all RN; proportion of URW to regulated workers (RNs and RPNs); RN/RPN//URW staff mix. Patient safety outcomes (patient falls, medication errors, wound infections, urinary tract infections); Case nursing hours (measure of nursing resource use); Patient complexity.	Lower proportions of professional nursing staff (RNs/RPNs) was related to higher number of medication errors and wound infections.

FIM = Functional independence measure; RN = Registered Nurse; RPN = Registered Practical Nurse; URW = unregulated workers

Table G22. Research studies related to shift work of nurses (types of shifts; length of shifts)

Author, Year, Publication Type	Aim of the Study	Sample	Study Design and Method	Variables	Results
Skipper[102]	Examine the relationship between the physical health and mental depression of nurse shift workers and relevant social and work related variables	482 RNs working shifts in five hospitals in the southeastern region of the U.S.	Descriptive survey Distributed questionnaires through the nurses' hospital	Physical health scale (e.g. quantity and quality of sleep; physical related problems); Depression measured by the CES-D scale; Family relation; Informal social participation (e.g. frequency visiting friends, relatives); Job performance measured by the Six-Dimension Scale of Nursing Performance; Job related stress scale. Covariates: age, marital status, number of children under age 6, education, work experiences, shift preferences, etc.	When controlling for the background variables, there was no relationship between difficulty in family relations and shift work or informal social participation and shift work. Shift work was associated with voluntary organization participation (most prevalent in the day shift nurses), hours spent in solitary activities (most prevalent in the evening shift nurses), and job performance (lowest perception of job performance by nurses working rotating shifts). Job related stress and shift work were significantly related (nurses working rotating shifts experienced the highest stress). No association was found between shift work and physical health or depression. There was an association with shift type and quality and quantity of sleep. Night shift nurses received the least amount of sleep and had the most trouble sleeping.
Gold[103]	Examine the impact of work schedule on the sleep schedule, sleepiness, and accident rates of female nurses in a Massachusetts hospital based on a self-administered questionnaire administered in 1986.	687 RNs and LPNs employed in one hospital	Cross-sectional Self-administered questionnaire in which nurses kept records for two weeks regarding their work schedules and sleep patterns	Nurses' record of shifts worked for two weeks and sleep and wake times for the same two weeks. Nurses' self-assessments of quality of sleep, sleepiness, automobile accidents or other injuries, medication, and procedural errors.	Night nurses and nurses that rotated shifts (rotators) had the highest odds of poorer quality of sleep and using sleeping medications. The odds of reporting any accidents or errors were higher for rotators than nurses working days or evenings.

Table G22. Research studies related to shift work of nurses (types of shifts; length of shifts) (continued)

Author, Year, Publication Type	Aim of the Study	Sample	Study Design and Method	Variables	Results
Ruggiero[104]	To determine variables contributing to chronic fatigue in critical care nurses and to determine if there are differences between critical care nurses working day and night shifts in regards to fatigue, depression anxiety, and quality of sleep.	Subjects were members of the American Association of Critical Care Nurses. 67 worked the day shift and 75 worked the night shift.	Descriptive, survey; two-group comparison Mailed survey	Chronic shift worker fatigue measured by the *Standard Shiftwork Index Chronic Fatigue Scale;* Global sleep quality measured by the *Pittsburgh Sleep Quality Index;* Depression measured with the *Beck Depresssion Inventory-II;* Anxiety measured with the *Beck Anxiety Inventory*. Demographic data obtained regarding age, gender, shift, and schedule details.	Permanent night nurses had significantly more depression and poorer global sleep quality; no significant differences between day and night shift nurses in chronic fatigue or anxiety. 46% of the variance in chronic fatigue was explained by depression and global sleep quality.
Rogers[105]	To examine the work patterns of hospital staff nurses and determine if there is a relationship between hours worked and frequency of errors.	393 RNs who were members of the American Nurses Association. Unit of analysis was number of shifts worked (5,317) over a 28-day reporting period.	Descriptive; survey Mailed log book	Nurse-reported data regarding hours worked (scheduled and actual), time of day worked, overtime, days off, sleep/wake patterns, mood, caffeine intake, errors and near errors.	Participants worked, on average, 55 minutes longer than scheduled each day. Almost 2/3 of the nurses worked overtime 10 or more times during the 28-day period. One quarter of the respondents worked more than 50 hours per week for two or more weeks of the 2-day period. More than 25% of nurses reported working mandatory overtime at least once during the 28 days. There were 199 reported errors and 213 reported near errors. More than half of the errors and near errors were medication related. The likelihood of making an error increased with longer work hours and was three times higher when nurses worked shifts lasting 12.5 hours or more (OR = 3.29). Working overtime increased the odds of making at least one error, regardless of how long the shift was originally scheduled (OR = 2.06). The risk of making errors increases when nurses work overtime after longer shifts. Age, hospital size, or type of unit did not have an effect on errors or near errors.

Table G22. Research studies related to shift work of nurses (types of shifts; length of shifts) (continued)

Author, Year, Publication Type	Aim of the Study	Sample	Study Design and Method	Variables	Results
Trinkoff[106]	To describe the nature and prevalence of extended work schedules of nurses	2,273 randomly selected RNs who participated in the NIOSH Nurses Worklife and Health Study	Cross-sectional survey Mailed survey	Work-schedule variables derived from the *Standard Shiftwork Index* hours worked per day and week; weekends worked/ month; days worked in a row; work more than one job; how off shifts are organized). Mandatory overtime requirement. Demographic characteristics.	When compared to the entire sample, hospital staff nurses were most likely to work 12 or more hours/day, but half as likely to work 6-7 days/week. They were more likely to work off-shifts. Similarly, nurses with more than one job worked more hours per week as well as more consecutive days. Nurses 50 years old and older were less likely to work long days and were the group that tended to work days only. 17% of the sample were required to work mandatory overtime. On call requirements were more prevalent among hospital staff nurses.
Havlovic[107]	Examine the impact of work schedule congruence on personal life interference and service to patients; examine the combined effects of the rotating shift and the compressed work week	520 randomly selected nurses in British Columbia that returned the mailed survey. Nurses were members of the nurses' union.	Descriptive correlational Mailed survey	Subscales from the Comprehensive Work-Schedule Survey (CWSS): Current Schedule Interference with Activities with Family & Friends; General Affect Toward Current Schedule; Service to External Constituents; Interference with Rest and Sleep. Nurse characteristics included full/part time status, shift and schedule currently working and preferred.	Over 40% of nurses worked a rotating compressed work week schedule and 47% were working both their preferred shift and work week. Nurses that worked their preferred shift, but not their preferred week reported lower interference with family and friends, a positive general affect toward their schedule and less interference with sleep and rest. Work week congruence was not significant for any of the dependent variables. Nurses with a rotating compressed work week schedule experienced more interference with their personal lives, including rest patterns as well as family and social activities, and most were dissatisfied with their schedules and reported lower quality service to their patients. Nurses who worked in larger hospitals (hospital factor) experienced greater interference of their work schedules with rest and sleep. Nurses that worked a longer time in a hospital (nurse factors) were less likely to report negative consequences of their work schedule.

Table G22. Research studies related to shift work of nurses (types of shifts; length of shifts) (continued)

Author, Year, Publication Type	Aim of the Study	Sample	Study Design and Method	Variables	Results
Hoffman[108]	Examine the variation in role stress and career satisfaction among hospital-based RNs by work shift length	Probability sample of 208 nurses who were members of the Michigan Nurses Association (50.4% response rate). N = 99 working predominantly 8-hour shift pattern; N = 105 working 12 hours shifts or a combination of 8, 10, and 12 hour shifts.	Descriptive comparative study Mailed questionnaires	Role stress (Nursing Stress Scale) Career satisfaction (Index of Work Satisfaction)	No significant demographic differences between groups. RNs working 12 hour shifts experienced significantly higher levels of stress than those working 8-hour shifts; however, when controlling for nursing experience, similar levels of stress were found in both groups. Both groups were similar in regards to work satisfaction and the only differences in career satisfaction was that 8-hour RNs were significantly more satisfied with their current salary and 12-hour RNs derived more satisfaction from professional status.

Table G23. Research studies related to use of agency/contract nursing staff in hospitals

Author, Year, Publication Type	Aim of the Study	Sample	Study Design and Method	Variables	Results
Hughes[109]	Examine differences between agency and hospital nurses as related to recruitment, retention, and compensation.	6,895 staff nurses responding to a survey sent by a state's Board of Nursing. Primary employer a staffing agency: n=3,360 Primary employer a hospital: n=3,535 (randomly selected)	Descriptive; survey Survey sent out with nurses' renewal of their license.	Items from the survey regarding nurses' non-salary compensation package; issues related to recruitment and retention; conditions for willingness or need to increase current work hours.	Hospital nurses were more likely to receive pension plans, health and dental insurance, reimbursement for continuing education and tuition; child care services, and parking. Agency nurses received significantly higher hourly wages. Agency nurses were more likely to indicate that improved benefits would be an incentive to change jobs whereas hospital nurses were more likely to change jobs for increased autonomy. There was no difference between the groups in terms of changing jobs for improved scheduling, specialty practice, or salary. Half of all nurses in the study indicated they would leave their job for increased salary, but there was no difference between agency and hospital nurses. While most nurses were willing to increase their work hours for incentives such as salary increases, child care services, improve relations at work, improved scheduling, promotion opportunities, and improved patient care, hospital nurses were more likely to increase their workload for those incentives.

Table G23. Research studies related to use of agency/contract nursing staff in hospitals (continued)

Author, Year, Publication Type	Aim of the Study	Sample	Study Design and Method	Variables	Results
Hughes[110]	Examine the sociodemographic characteristics of agency and hospital staff nurses and determine if there are differences in their work schedules and clinical practice.	6,895 staff nurses responding to a survey sent by a state's Board of Nursing. Primary employer a staffing agency: n=3,360 Primary employer a hospital: n=3,535 (randomly selected)	Descriptive; survey Survey sent out with nurses' renewal of their license.	Items from the survey regarding nurses' work schedules, practice activities/use of clinical skills, and perception of nurses regarding opportunities in their jobs to use the clinical skills.	Agency nurses were more likely to be male, unmarried, and members of minority groups, and have a master's degree, whereas hospital nurses were more likely to be enrolled in an education program at least part time. Agency nurses were more likely to work evening and night shifts as well as weekend shifts and fewer hours per week than hospital employed nurses. There were significant differences in the clinical practice of both groups. Hospital nurses reported performing more physical and psychological examinations on a greater percentage of their patients. Agency nurses evaluated clinical outcomes, developed nursing diagnoses and therapeutic plans for more patients. Agency nurses differed significantly from hospital nurses in regard to reporting they had a very or fairly good chance to use their skills; whereas hospital nurses felt they had little or no chance. Agency nurses used computers to a significantly lesser extent than hospital nurses.

Table G23. Research studies related to use of agency/contract nursing staff in hospitals (continued)

Author, Year, Publication Type	Aim of the Study	Sample	Study Design and Method	Variables	Results
Warren[111]	To examine nurse managers' use, perceptions of costs, benefits and quality of care of supplemental nursing staff.	89 nurses in management positions in two urban and two rural hospitals randomly selected from 32 hospitals in a southeastern state.	Descriptive; survey Mailed questionnaire	Investigator developed questionnaire that queried the use of supplemental staffing and perceptions of the quality of care provided by supplemental staff nurses. Supplemental staff could be either agency-based or hospital-pool.	While the majority of nurse managers believed that the use of supplemental nurses would increase in the future, they did not believe it was a cost effective practice. 59 of the 89 respondents had used supplemental staffing. The primary reason for non-use was perception of poor quality care. Those that had used supplemental staff indicated that it resulted in reduction of overtime and workload for nursing staff as well as covering for weekends, night shifts, absenteeism, and vacations. Managers' perceptions of quality care of supplemental staff did not differ for hospital pool supplemental staff versus agency staff.
Strzalka[112]	To compare float pool nurses (FPN), agency nurses (AN), and unit-hired nurses (UHN) on selected clinical indicators.	Over the course of 8 months, medical records associated with nurses on one nursing unit from each of the three groups were reviewed. 150 records were reviewed—50 from each group. Study was conducted in a large teaching hospital in the southeastern U.S.	Descriptive comparative design	Two clinical aspects of care were monitored: patient safety measures to prevent falls and assessment and management of bowel function. Patient flow sheets in the patients' medical records were reviewed.	Float pool nurses had the highest rate of documentation, followed by agency nurses and then unit-hired nurses. There were statistically significant differences between FPNs and UHNs for 3 of 5 indicators to prevent falls and a statistically significant difference between ANs and FPNs on 1 of 3 indicators for bowel management and between UHNs and ANs and FPNs on 1 of 3 indicators for bowel management.

Table G23. Research studies related to use of agency/contract nursing staff in hospitals (continued)

Author, Year, Publication Type	Aim of the Study	Sample	Study Design and Method	Variables	Results
Bloom[18]	Assess the effect of four nurse staffing patterns on the efficiency of patient care delivery: RNs from temporary agencies; part-time career RNs; RN rich skill mix; and organizationally experienced RNs	Random sample of 1,222 hospitals selected; 583 hospitals in sample	Descriptive correlational	Nursing Personnel Survey which includes information about full and part time staff, use of agency staff, RN mix and experience. Merged data from the American Hospital Association's annual survey of hospitals and the Area Resource File. Hospital efficiency was the dependent variable and measured as personnel costs per adjusted admission and total non-personnel operating costs per adjusted hospital admission. Control variables: hospital size, ownership/control; teaching status; occupancy rate; length of stay; geographic region; urban/rural status; regulatory intensity by state; local economic climate; hospital wage rates; hospital competition within a service area; supply of nursing labor within the community.	Use of part-time staff was related to lower personnel and hospital costs; skill mix was unrelated to personnel and hospital costs; use of temporary RNs was not related to personnel costs but was related to higher hospital operating costs.

Table G24. Research studies related to full- and part-time nursing staff

Author, Year, Publication Type	Aim of the Study	Sample	Study Design and Method	Variables	Results
Jolma[113]	Examine the relationship between nursing workload and turnover.	Randomly selected sample of medical-surgical staff nurses employed in Arizona (n=270). 123 respondents with usable questionnaires.	Descriptive correlational Mailed questionnaire	Nursing workload was measured by the *Role Overload* subscale and intent to turnover was measured by the *Intention to Turnover* subscale, both part of the *Michigan Organizational Assessment Questionnaire.* Demographic questionnaire including information on full- and part-time status.	Full-time status, large hospital size, and large unit size were associated with higher role overload and turnover intent.
Wetzel[114]	Comparison of personal and job characteristics and work-related attitudes of full-time and part-time registered nurses.	Full and part time RNs employed in three large urban hospitals in a Canadian province. Stratified sampling technique to ensure representation of full- and part-time RNs. Questionnaire sent to 930 nurses with 634 responding. Eliminated nurses with less than a year of employment resulting in a final sample of 595.	Descriptive comparative design Mailed questionnaires	Job characteristics and work related attitude measures: organizational commitment; professionalism; job involvement; extrinsic and intrinsic job satisfaction, satisfaction with supervisor; difficulty leaving job; influence on decision making. No description provided of the questionnaire, reliability and validity.	Part-time nurses were older, married, had greater tenure in the organization, and more experience. Statistically significant difference in job involvement between full- and part-time nurses. Full-time nurses were significantly more job involved. There was no difference between full- and part-time nurses on the other work-related attitude items.
Porter[115]	Determine if there were self-image differences between beginning and expert nurses, caregivers and non-caregivers, educational levels of nursing and full-time and part-time staff.	363 nurses in a midwestern hospital responding to a survey.	Descriptive; comparative Method for distributing questionnaires not provided.	Self image measured by *Porter Nursing Image Scale* (3 factors: interpersonal power; interpersonal relations; interpersonal ability) and demographic questionnaire	More positive scores on the three factors were found for full-time versus part-time nurses; there was a statistically significant difference for the interpersonal power factor (e.g. leader; functioning in an independent manner).

Table G24. Research studies related to full- and part-time nursing staff (continued)

Author, Year, Publication Type	Aim of the Study	Sample	Study Design and Method	Variables	Results
Bloom[18]	Assess the effect of four nurse staffing patterns on the efficiency of patient care delivery: RNs from temporary agencies; part-time career RNs; RN rich skill mix; and organizationally experience RNs	Random sample of 1,222 hospitals selected; 583 hospitals in sample	Descriptive correlational Secondary data	Nursing Personnel Survey which includes information about full- and part-time staff, use of agency staff, RN mix and experience. Merged data from the American Hospital Association's annual survey of hospitals and the Area Resource File. Hospital efficiency was the dependent variable and measured as personnel costs per adjusted admission and total non-personnel operating costs per adjusted hospital admission. Control variables: hospital size, ownership/control; teaching status; occupancy rate; length of stay; geographic region; urban/rural status; regulatory intensity by state; local economic climate; hospital wage rates; hospital competition within a service area; supply of nursing labor within the community.	Use of part-time staff was related to lower personnel and hospital costs; skill mix was unrelated to personnel and hospital costs; use of temporary RNs was not related to personnel costs but was related to higher hospital operating costs.

Table G24. Research studies related to full- and part-time nursing staff (continued)

Author, Year, Publication Type	Aim of the Study	Sample	Study Design and Method	Variables	Results
Burke[116]	Examine the effects of hospital restructuring and downsizing on full- and part-time nursing staff.	Randomly selected nurses employed in Ontario hospitals and members of a nurses union. N=1,362 Part time: 700 Full time: 645	Descriptive, correlational Mailed questionnaire	Personnel and situational characteristics which included whether the respondent worked full or part time. Restructuring and downsizing measures (extent of restructuring; workload; staff bumping; impact of generic workers). Threats to security (e.g. layoff, change of employment status to part time). Impact on staff and institutions (job insecurity feelings; impact of restructuring on hospital functioning; impact on hospital facilities). Implementation and management measures (fairness, communication, vision, staff participation, revitalization). Organizational support. Work outcomes (job satisfaction, intent to quit and absenteeism). Psychological well-being indicators (emotional exhaustion, cynicism, professional efficacy, psychosomatic symptoms, physical health, medication use, lifestyle habits)	Full- and part-time nurses differed significantly on the majority of demographic and situational characteristics (e.g. full-time nurses more experience in nursing, worked more hours per week, older, higher levels of education, less likely to be married). They responded to the effects of downsizing and restructuring quite similarly, but full-time nurses reported significantly heavier workloads. They were also similar in regards to job satisfaction, but full-time nurses were more likely to be absent and less likely to quit. Full-time nurses reported significantly higher levels of exhaustion, cynicism, and professional efficacy (psychological burnout). They were also more likely to report poorer physical health, greater medication use, and poorer lifestyles (physical wellbeing).

Table G24. Research studies related to full- and part-time nursing staff (continued)

Author, Year, Publication Type	Aim of the Study	Sample	Study Design and Method	Variables	Results
Havlovic[107]	Examine the impact of work schedule congruence on personal life interference and service to patients; examine the combined effects of the rotating shift and the compressed work week.	520 randomly selected nurses in British Columbia that returned the mailed survey. Nurses were members of the nurses' union.	Descriptive correlational Mailed survey	Subscales from the Comprehensive Work-Schedule Survey (CWSS): Current schedule Interference with activities with family & friends; general affect toward current schedule; Service to external constituents; interference with rest and sleep. Nurse characteristics including full- and part-time status, shift and schedule currently working and preferred	Specific to full- and part-time status of nurses, nurse who worked part-time reported providing higher quality service to patients, liked their present work schedules more, and experienced less interference between their work and non-work activities. Nurses who worked part time on a contingent basis did not have these positive experiences.

Table G25. Research studies related to internationally educated nurses (IEN)

Author, Year, Publication Type	Aim of the Study	Sample	Study Design and Method	Variables	Results
Crawford[117]	Compare processes of U.S. and IEN nurses' experience to acquire licensure, and compare practice settings of U.S. nurses and IENs.	Stratified random sample of 1,000 RNs educated in the U.S. and 1,000 RNs educated in targeted foreign countries (10% Philippines, 20% India, 10% Canada, 10% South Korea, 10% Nigeria, 10% England, 10% USSR, and 10% China) and who had successfully completed the NCLEX-RN examination. U.S. response rate = 570 (58.7%) IEN response rate = 401 (45.5%)	Descriptive survey Potential responders were selected from the nurses who had successfully completed the NCLEX-RN examination between September 1 and November 30, 2002. A 4-stage mailing process was used to engage participants. Selected potential responders were sent the Practice and Professional Issues Survey (PPI) which is routinely used by the National Council of State Boards of Nurses to collect information from entry-level nurses of practice activities.	Demographic data; description of process experienced by nurses to complete the application for U.S. RN licensure and secure a job; work settings, geographic locations.	35% of IENs worked with a recruiter when completing the steps for U.S. nursing licensure. The average amount of time to complete the process to receive a U.S. RN licensed for IENs was 23 months, but 19 months for those using a recruiter. 34% of IEN RNs secured a nursing position in the U.S. before moving to the U.S. from their home country. U.S. nurses were more likely to report working in critical care (29.8 %) and medical surgical units (42.7%). IENs were more likely to work in medical surgical units (41.4%) and nursing homes (21.6%).
DiCicco-Bloom[118]	To describe the experiences of a group of immigrant women nurses regarding their life and work in a culture other than their own.	Snowball sample initiated with the South Asian Nurses Association in New York state. 10 participants educated in India between the ages of 40-50, married, and lived in either Pennsylvania (n=3) or New Jersey (n=7). All were educated in India.	Descriptive, qualitative design. Semi structured interviews with open-ended questions were used to evaluate for themes of life and work as reported by the female immigrants from India.	Descriptive experiences of nurses educated in India and living and working in the U.S. as RNs	The themes emerging from the interviews were related to the challenges of living between two cultures and countries, racism experienced by the participants and their experience of marginalization as female nurses of color.

Table G25. Research studies related to internationally educated nurses (IEN) (continued)

Author, Year, Publication Type	Aim of the Study	Sample	Study Design and Method	Variables	Results
Flynn[119]	Examine differences, between cultures of the U.S. and international nurses regarding core values of nursing (autonomy, control over practice, and relationship with physicians); job satisfaction; and levels of burnout	820 nurses who worked at least 16 hours per week on one of the 40 study units. N=252 international in origin N=547 U.S. in origin	Comparative descriptive study using secondary data collected in 1991 from 40 inpatient care units in 20 hospitals located in 11 U.S. cities with a high incidence of AIDS.	Country of origin (IV); values related to the professional nursing practice environment (Nursing Work Index-6 subscales); emotional exhaustion (Maslach Burnout Inventory)	124 of the international nurses received their nursing education outside of the U.S. No differences were found between country of origin and three of the subscales of the Nursing Work Index (control over practice, relationships with physicians, and importance of hierarchy). Significant differences were found for three of the subscales (autonomy, ambiguity reduction, and collectivism). The absence of a professional practice environment was a significant predictor of emotional exhaustions among both U.S. and international nurses.
Pizer[120]	Compare job satisfaction and demographics for U.S. and IEN in six New York City pubic hospitals.	857 direct care nurses from six public hospitals in New York City. N=857 IEN nurses N=535 U.S. nurses	Comparaitive study design. A two-part survey was developed for study by the Institute for Health Policy distributed to nurses.	Demographics (e.g. education, shift worked, overtime, age, experience, unit type). Job satisfaction (Nurse Job Satisfaction Survey)	Internationally educated nurses were younger and held a baccalaureate degree. They were more likely to be male, have less children, work off shifts and more overtime, work in specialty units, and had less experience as an RN that U.S. nurses. No differences between the two groups were found in job satisfaction for time to do the job and satisfaction with quality of care they were able to provide. There was a small significant difference for enjoyment of job with U.S. nurses reporting slightly more job enjoyment. This difference disappeared however when nurses who had positions that required both administrative responsibilities and direct care were omitted. Being a IEN did not provide any explanation of variance for the three subscales of the NJSS.

Table G25. Research studies related to internationally educated nurses (IEN) (continued)

Author, Year, Publication Type	Aim of the Study	Sample	Study Design and Method	Variables	Results
Xu[121]	Describe the demographic, educational, and employment characteristics of Internationally Educated Nurses (IENs) with comparison to U.S. trained nurses.	35,579 nurses from the 2000 National Sample Survey of Registered Nurses; 3.7% of sample (1,300) were IENs.	Descriptive study using secondary data from the 2000 National Sample Survey of Registered Nurses (NSSRN),	Age, gender, education, employment (full time vs. part time; work hours) work setting and unit; position; income; job satisfaction, reasons for not working.	IENs were generally younger than U.S. nurses. Most were from the Philippines (38.9%), followed by Canada (17.5%), India (10.9%) and the UK (8.9%). IENs are more likely to be baccalaureate prepared over USNs (38.3% and 30% respectively) and more likely to work full time (73.7% vs. 59.1%). Many of the IENs were on contract to work full time and thus did not have an option to work part time. There was no difference in job satisfaction between the two groups. The rate of IENs who left nursing was only half that of U.S. nurses (2.3% vs. 4.6%).
Yi[122]	Investigate how Korean nurses adjust to the U.S. hospital settings, the processes by which they adjust, and how their cultural background affects their adjustment process.	Purposive sample of 12 Korean nurses working in the U.S.	Exploratory study using a grounded theory method using semi-structured, indepth interviews.	Experience of Korean nurses' adjustment to U.S. hospitals.	Adjustment to U.S. hospitals involves two stages. Initial stage of adjustment is 2-3 years involving three stages: 1) relieving psychological stresses; 2) overcoming the language barriers; 3) accepting U.S. nursing practice. 5-10 years for two later stages: 1) adopting U.S. styles of problem-solving strategies; 2) adopting styles of U.S. interpersonal relationships.

USNs = U.S. trained nurses

Table G26. Research related to nursing staff overtime

Author, Year, Publication Type	Aim of the Study	Sample	Study Design and Method	Variables	Results
Shader[123]	Examine the relations between work satisfaction, stress, age, cohesion, work schedule, and anticipated turnover	Staff nurses and nurse managers from 12 units in a 908-bed university hospital in the southeastern U.S. N = 241	Descriptive study using a cross-sectional survey design. Questionnaire distributed directly to nurses during work hours.	Nurse work satisfaction (Index of Work Satisfaction) Job stress (modified version of the Job Stress Scale). Group cohesion (Bryne Group Cohesion Scale). Anticipated turnover (Anticipated Turnover Scale). Actual turnover (calculated as a ratio of the number of people who resigned to the average number of staff working for one year) Unit demographics (e.g., size of the unit, turnover data, patient satisfaction scores, overtime, acuity, ADC, staffing mix, and reallocation). Nurse demographics (e.g., age, gender, position, years of experience, tenure, education, shift worked).	Specific to overtime, work satisfaction, weekend overtime, job stress, and group cohesion predicted anticipated turnover rate and explained 31% of the variance

Table G26. Research related to nursing staff overtime (continued)

Author, Year, Publication Type	Aim of the Study	Sample	Study Design and Method	Variables	Results
Berney[124]	To determine factors that influence overtime use among various hospitals and within the same hospitals from year to year	General acute care hospitals in New York state that filed Institutional Cost Reports (ICR) 1995 to 2000. Over the five years, hospitals included in analysis ranged from 167 to 174 hospitals. Observations represented hospital years and varied from 1,008 to 1,028.	Secondary data from cost reports	Straight time and overtime hours; proportion of RN hours for acute inpatients that were overtime hours; ownership; location; teaching; unionization.	RNs, on average, worked 4.5%, of their total hours as overtime (under 2 hours/week; range 0 to 8 hours/ week. Multivariate analysis results found that within hospitals, an increase of 1 hour of RN straight time per patient day was associated with a 10% decrease in overtime. Occupancy, average hourly wage and hours in the average work week were not associated with RN overtime within hospitals. When controlling for year to year variations in overtime for each hospital, higher RN straight hours were significantly associated with higher RN overtime. Each 1 hour increase in straight time was associated with an 8.7% increase in overtime. Government hospitals used 44% less overtime than did for-profit and nonprofit hospitals. Having unionized RNs was associated with a 22% higher rate of overtime use.

Table G26. Research related to nursing staff overtime (continued)

Author, Year, Publication Type	Aim of the Study	Sample	Study Design and Method	Variables	Results
Rogers[105]	To examine the work patterns of hospital staff nurses and determine if there is a relationship between hours worked and frequency of errors.	393 RNs who were members of the American Nurses Association. Unit of analysis was number of shifts worked (5,317) over a 28 day reporting period.	Descriptive; survey Mailed log book	Nurse-reported data regarding hours worked (scheduled and actual), time of day worked, overtime, days off, sleep/wake patterns, mood, caffeine intake, errors and near errors.	Participants worked, on average, 55 minutes longer than scheduled each day. Almost 2/3 of the nurses worked overtime 10 or more times during the 28-day period. One quarter of the respondents worked more than 50 hours per week for two or more weeks of the 28-day period. More than 25% of nurses reported working mandatory overtime at least once during the 28 days. There were 199 reported errors and 213 reported near errors. More than half of the errors and near errors were medication related. The likelihood of making an error increased with longer work hours and was three times higher when nurses worked shifts lasting 12.5 hours or more (OR-3.29). Working overtime increased the odds of making at least one error, regardless of how long the shift was originally scheduled (OR=2.06). The risk of making errors increases when nurse work overtime after longer shifts. Age, hospital size or type of unit did not have an effect on errors or near errors.

Table G26. Research related to nursing staff overtime (continued)

Author, Year, Publication Type	Aim of the Study	Sample	Study Design and Method	Variables	Results
Trinkoff[106]	To describe the nature and prevalence of extended work schedules of nurses.	2,273 randomly-selected RNs who participated in the NIOSH Nurses Worklife and Health Study.	Cross-sectional survey Mailed survey	Work-schedule variables derived from the *Standard Shiftwork Index* hours worked per day and week; weekends worked/month; days worked in a row; work more than one job; how off shifts are organized). Mandatory overtime requirement. Demographic characteristics.	When compared to the entire sample, hospital staff nurses were most likely to work 12 or more hours/day, but half as likely to work 6-7 days/week and off-shifts. Similarly, nurses with more than one job worked more hours per week as well as more consecutive days. Nurses 50 and older were less likely to work long days and were the group that tended to work days only. 17% of the sample was required to work mandatory overtime and 2/3 were required to do so with less than a 2 hour notice. There were no differences in the prevalence of mandatory overtime among hospital staff RNs compared with the overall sample, those working more than one job and those 50 years and older. Single parents were more likely to work jobs with mandatory overtime. Those whose jobs included mandatory overtime worked significantly longer hours. On call requirements were more prevalent among hospital staff nurses.

Table G26. Research related to nursing staff overtime (continued)

Author, Year, Publication Type	Aim of the Study	Sample	Study Design and Method	Variables	Results
O"Brien-Pallas[125]	Determine factors contributing to high RN injury claim rates in Canadian hospitals.	127 hospitals in Ontario, Canada N = 8,044 RNs	Cross-sectional study Secondary data (1998-99)	Workload and staffing data (mandatory annual Ontario Ministry of Health and Long Term Care hospital submissions; Nursing lost-time injury claims data (Ontario Workplace Safety and Insurance Board database); Organizational (job dissatisfaction), nurse characteristics (age, health, missed shifts, emotional exhaustion, autonomy in practice, control over practice, nurse-physician relationships).	High hospital RN lost-time claim rates were increased by 70% for each quartile increase in the percentage of RNs reporting more than one hour of overtime per week.
Berney[126]	Examine trends in the use of overtime by hospitals to determine whether overtime has been increasing more rapidly in some kinds of hospitals than in others.	150 hospitals in New York State	Secondary data from cost reports	Straight time and overtime hours; proportion of RN hours for acute inpatients that were overtime hours; ownership; location; teaching; unionization.	Overtime increased 51% from 1995-2002. Overtime increased more in nongovernment, unionized hospitals and non teaching hospitals.

Table G27. Evidence of the association between nurse skill mix (proportion of registered nurses) and patient outcomes

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes Source to Measure Nurse Skill Mix, Definition of Nurse Skill Mix	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
ANA[56] An average hospital rate of nosocomial pneumonia, urinary tract infections, postoperative infections as secondary diagnoses in surgical patients; % RN Hours/total nursing hours	Hospitals 131 Unit Combined Patients Combined		Relative risk Urinary tract infection
		Increase by 1% in RNs in New York, 1992	1.00
		Increase by 1% in RNs in New York, 1994	0.99
		Increase by 1% in RNs in California, 1992	0.99
		Increase by 1% in RNs in California, 1994	0.99
			Pneumonia
			Rate, % Relative risk
		Increase by 1% in RNs in New York, 1992	0.00 1.00
		Increase by 1% in RNs in New York, 1994	0.00 1.00
		Increase by 1% in RNs in California, 1992	-0.56 0.99
		Increase by 1% in RNs in California, 1994	-0.39 1.00
			Pressure ulcers
			Rate, % Relative risk
		Increase by 1% in RNs in New York, 1992	-1.77 0.98
		Increase by 1% in RNs in New York, 1994	-1.23 0.99
		Increase by 1% in RNs in California, 1992	-0.79 0.99
		Increase by 1% in RNs in California, 1994	-1.23 0.99
			Nosocomial infections
			Rate, % Relative risk
		Increase by 1% in RNs in New York, 1992	0.00 1.00
		Increase by 1% in RNs in New York, 1994	0.00 1.00
		Increase by 1% in RNs in California, 1992	-0.53 0.99
		Increase by 1% in RNs in California, 1994	-0.47 1.00

Table G27. Evidence of the association between nurse skill mix (proportion of registered nurses) and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes Source to Measure Nurse Skill Mix, Definition of Nurse Skill Mix	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Barkell[77] The incidence of urinary tract infection: a) presence of white blood cells >100/high-powered field (HPF) on urinalysis, b) bacteria 3+/ high-powered field F or 4+/ high-powered field on urinalysis, and c) urine culture showing >100,000 colonies of one or two (not three or more) organisms; the incidence of pneumonia; proportion of RN/ total nursing staff.	Hospitals 1 Unit Surgical Patients Surgical Race 88.1 Sex 40.7	Team nursing model with patient care associate assisting RNs in delivery of patient care (lower proportion of RN: 65.8%) Total patient care model, higher proportion of RN: 78.6%)	Pneumonia, rate % 5.1 0
Berney[84] Actual number of urinary tract infections, gastrointestinal bleeding, and sepsis events identified as secondary DRG; RN acute hours/(RN + LPN acute hours)	Hospitals 161	1% increase in RN hours/total licensed hours, medical patients 1% increase in RN hours/total licensed hours, surgical patients 1% increase in RN hours/total licensed hours, medical patients 1% increase in RN hours/total licensed hours, surgical patients 1% increase in RN hours/total licensed hours, medical patients 1% increase in RN hours/total licensed hours, surgical patients	Relative risk Urinary tract infection 1.00 0.99 1.00 1.00 0.99 1.00 Gastrointestinal bleeding 1.00 1.00 1.01 1.01 1.00 1.01 Sepsis 1.01 1.00 1.01 1.01 1.00 1.01
Blegen[58] The number of patient falls on the unit in quarter/1,000 patient days; the number of CPR on the unit in quarte/1,000 patient days; RN hours per patient day divided by all hours per patient day	Hospitals 11 Unit Combined Patients Combined	Increase by 1% in proportion of RN Increase by 1% in proportion of RN	Rate per 100 patient days ± SD Falls -0.05 ± 1.63 CPR -0.01 ± 0.55

Table G27. Evidence of the association between nurse skill mix (proportion of registered nurses) and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes Source to Measure Nurse Skill Mix, Definition of Nurse Skill Mix	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Blegen[73] The number of patient falls on the unit in quarter/1,000patient days; RN hours per patient day divided by all hours per patient day		Proportion of BSN 73% 72%	Rate/100 patient days ± SD Falls 0.22 ± 0.18 0.27 ± 0.28
Blegen[59] New incidences of skin breakdown secondary to pressure or exposure to urine or feces; suddenly and involuntarily leaving a position and coming to rest on the floor or some object. All reported falls were included whether or not injuries resulted. RN hours per patient day divided by all hours per patient day	Hospitals 1 Unit Combined Patients Combined	 Increase by 1% in proportion of RN nurses Proportion of RN >87.5% Increase by 1% in proportion of RN nurses Proportion of RN >87.5% Increase by 1% in proportion of RN nurses Proportion of RN >87.5%	Rate/100 patient days ± SD Decubitus ulcer -1.06 ± 3.36 0.25 ± 0.12 Falls 0.04 ± 3.01 -0.22 ± 0.10 Nosocomial infection -1.26 ± 6.15 0.13 ± 0.22
Bolton[26] Hospital-acquired pressure ulcers; the monthly rate per 1,000 patient days for each nursing unit and each hospital. Data are collected at the patient level and aggregated by CalNOC staff to the unit level. Unplanned descent to the floor in adult patients; the monthly fall rate per 1,000 patient days for each nursing unit and each hospital; % of RN hours/total nursing hours.	Hospitals 38	% RN Medical-surgical units 59 Critical care units 91	Rate/100 patient days Falls Pressure ulcers 3.70 8.00 0.10 13.00

Table G27. Evidence of the association between nurse skill mix (proportion of registered nurses) and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes Source to Measure Nurse Skill Mix, Definition of Nurse Skill Mix	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Cheung[32] Pressure ulcers, patient falls coded as secondary diagnosis, primary bloodstream infections after admitting the unit, ratio of RN and LPN among to unlicensed nursing personnel	Hospitals 1 Unit Combined Patients Medical	Increase by 1% of licensed nurses	Relative risk of decubitus ulcers, failure to rescue, and nosocomial infection Not significant
Cho[38] ICD-9-CM for urinary tract infections ICD-9-CM for pressure ulcers ICD-9-CM for falls and injury ICD-9-CM for surgical wound infection ICD-9-CM for sepsis ICD-9-CM for adverse drug event. RN Hours divided by all hours	Unit Combined Patients Combined Hospitals 48 48 79 79 48 48 48 48 48 79 12 12 12 79 12 12 12 48 48 48 232	% RN 70 50 60 90 60 60 80 90 50 70 50 80 50 60 70 80 90 80 90 70 100% increase in RN hours 100% increase in RN hours 100% increase in RN hours	Pneumonia, rate % 1.67 2.03 1.72 1.28 1.96 1.84 1.51 1.37 2.16 1.56 2.08 1.42 1.90 1.89 1.71 1.55 1.41 1.61 1.46 1.78 Relative risk, 95% CI Urinary tract infection 0.92 0.31 2.64 Pneumonia 0.37 0.15 0.91 Falls 0.96 0.21 4.49 Pulmonary failure

Table G27. Evidence of the association between nurse skill mix (proportion of registered nurses) and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes Source to Measure Nurse Skill Mix, Definition of Nurse Skill Mix	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
		100% increase in RN hours	0.75 0.11 4.98
			Surgical wound infection
		100% increase in RN hours	0.52 0.21 1.30
			Sepsis
		100% increase in RN hours	1.20 0.43 3.33
Cho[30] The same study	Unit Combined Patients Combined Age 67.9 Race 79.3 Sex 48.9 Severity 49.7	% RN 76.5 68.1 72.4 72.7 76.5 68.1 72.4 72.7 76.5 68.1 72.4 72.7 76.5 68.1 72.4 72.7 76.5 68.1 72.4 72.7 76.5 68.1 72.4 72.7	Rate, % ± SD 2.50 ± 1.30 1.60 ± 1.40 2.00 ± 1.00 2.10 ± 1.80 Pneumonia 3.10 ± 1.90 2.70 ± 2.20 2.80 ± 1.30 2.80 ± 2.00 Falls 0.20 ± 0.20 0.20 ± 0.30 0.20 ± 0.20 0.10 ± 0.20 Pressure ulcers 0.10 ± 0.30 0.30 ± 0.60 0.30 ± 0.50 0.20 ± 0.40 Surgical wound infection 1.60 ± 1.00 1.10 ± 1.10 1.50 ± 0.70 1.10 ± 1.00 Sepsis 1.20 ± 0.70 0.80 ± 0.80 1.10 ± 0.60 1.00 ± 1.10

Table G27. Evidence of the association between nurse skill mix (proportion of registered nurses) and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes Source to Measure Nurse Skill Mix, Definition of Nurse Skill Mix	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Cimiotti[87] Infections occurring in an infant 48 hours or longer after admission to the Neonatal Intensive Care Unit including bloodstream infections, device associated pneumonia, Central nervous System and skin infections, conjunctivitis. % of RN hours among total nursing hours adjusted for nursing intensity weights	Hospitals 1 Unit Neonatal Patients Medical	% RN 100 96 100 96	Rate, % Pneumonia Nosocomial infection 0.50 18.30 0.90 15.10 Sepsis 10.50 5.50
Donaldson[9] Total number of patients with Stage I-IV pressure ulcers regardless of whether ulcer was acquired during hospitalization or present on admission; %/total number of surveyed patients; unplanned descent to the floor; rate/1,000 patient days; % of RN hours/total nursing care hours; % of licensed hours/total nursing care hours.	Hospitals 68 Patients Medical Unit Combined Combined ICU ICU	% RN % licensed nurses 59.2 67.52 66.67 74.29 68.79 72.99 72.19 75.54 59.2 67.52 66.67 74.29 68.79 72.99 72.19 75.54	Rate/100 patient days ± SD Falls 0.31 ± 0.20 0.32 ± 0.17 0.30 ± 0.22 0.26 ± 0.16 Pressure ulcers 14.07 ± 11.07 14.48 ± 10.39 13.52 ± 10.78 16.29 ± 10.27
Donaldson[95] Patients' unplanned descent to the hospital floor; were analyzed as 7 day aggregate per unit; also actually number per unit; the number of falls/1,000 patient days, the % of RN hours / total care hours per day, per unit.	Hospitals 25 Unit Combined Patients Medical	Increase by 1% in RN hours of care Increase by 1% licensed hours of care	Rate/100 patient days ± SD Falls -0.0020 ± 0.00 -0.0010 ± 0.01

Table G27. Evidence of the association between nurse skill mix (proportion of registered nurses) and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes Source to Measure Nurse Skill Mix, Definition of Nurse Skill Mix	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Flood[53] infections including urinary tract infection and gangrene; Complications: congestive heart failure and arrhythmias, gastrointestinal bleeding	Hospitals 1 Unit Combined Patients Medical Sex 60	% RN Understaffed unit 60.45 Normally staffed unit 42.32 Understaffed unit 60.45 Normally staffed unit 42.32	Rate, % Nosocomial infections 0.16 0.19 Complications 64 71
Grillo-Peck[10] The number of reported monthly incidents in the unit, total number of infected patients per month of the entire unit census. Decrease in % of RNs in the unit within new partnership model with increase patient care technicians and service associates. RN spent more time on direct patient care.	Hospitals 1 Unit Specialty Patients Medical Sex 43.7	% RN 80 60 80 60	Rate, % ± SD Falls 8.69 ± 3.93 3.53 ± 1.66 Nosocomial infection 16.48 ± 32.87 10.39 ± 32.92
Halm[51] Failure to rescue: death following complications within 30 days	Hospitals 1 Unit Surgical Patients Surgical Age 55.6 Sex 37.4 Severity 22.7	Increase by 1 unit in RN/patient ratio	Failure to rescue, relative risk NS
Hope[86] Incidence rate of urinary tract infection, ventilator associated pneumonia, surgical site infections, and infections that occurred after 72 hours of hospitalization; incidence rate of positive culture with known pathogen or two or more positive cultures with pathogens (one can be considered as contaminant); proportion of RN hours/total	Hospitals 1 Sex 44.99 Units Surgical Surgical Surgical Surgical Medical Medical Medical Medical Medical Medical	% RN 83.65 84.26 81.73 85.09 98.81 77.28 76.48 89.7 98.6 80.4 78.12	Rate/100 patient days Nosocomial Infection 3.08 20.00 4.62 10.77 0.00 6.15 1.54 1.54 0.00 0.00 3.08

Table G27. Evidence of the association between nurse skill mix (proportion of registered nurses) and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes Source to Measure Nurse Skill Mix, Definition of Nurse Skill Mix	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
nursing hours/patient day 4-10 days before the event occurred	Medical	76.23	10.77
	Medical	98.75	0.00
	Specialty	94.48	33.85
	ICU	99.56	1.54
	ICU	99.11	3.08
	Surgical	92.11	0.00
	Neonatal		Sepsis
		83.65	7.54
	Surgical	84.26	11.80
	Surgical	81.73	0.33
	Surgical	85.09	4.59
	Surgical	98.81	0.00
	Medical	77.28	7.21
	Medical	76.48	2.95
	Medical	89.7	1.31
	Medical	80.4	7.87
	Medical	78.12	8.20
	Medical	76.23	6.56
	Medical	98.75	1.97
	Spec	94.48	23.28
	ICU	99.56	9.51
	ICU	99.11	4.59
	Surgical	92.11	2.30
	Neonatal		Relative risk, 95% CI
			Urinary tract infection
		Increase by 1% in proportion of RN	1.01 1.00 1.01
			Pneumonia
		Increase by 1% in proportion of RN	1.06 0.93 1.21
			Nosocomial infection
		Increase by 1% in proportion of RN	1.06 1.03 1.09
			Surgical wound infection
		Increase by 1% in proportion of RN	1.03 0.99 1.08
			Sepsis
		Increase by 1% in proportion of RN	1.05 1.04 1.07

Table G27. Evidence of the association between nurse skill mix (proportion of registered nurses) and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes Source to Measure Nurse Skill Mix, Definition of Nurse Skill Mix	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Houser[49] Failure to rescue: death/1,000 patients who developed complications of care during hospitalization; cases of decubitus ulcer/1,000 discharges identified as secondary diagnosis; cases of acute respiratory failure/1,000 surgical discharges; cases of deep vein thrombosis or pulmonary embolism/1,000 surgical discharges. Reported by hospitals ratio reported RN FTE/RN+LPN	Unit Combined Patients Medical Age 55.08 Race 51 Sex 42 Hospitals	% RN	Rate, % ± SD Failure to rescue
	170	79	11.61 ± 8.41
	172	86	13.82 ± 5.80
	174	87	12.40 ± 9.11
	171	88	10.51 ± 6.82
	39	88	9.01 ± 6.26
	14	88	9.42 ± 10.16
	8	86	5.43 ± 8.89
			Decubitus ulcer
		79	2.21 ± 1.78
		86	2.57 ± 1.62
		87	2.14 ± 1.45
		88	1.90 ± 1.70
		88	1.70 ± 1.39
		88	1.44 ± 1.48
		86	2.24 ± 4.21
			Pulmonary failure
		79	0.26 ± 0.65
		86	0.33 ± 0.37
		87	0.32 ± 0.37
		88	0.19 ± 0.42
		88	0.15 ± 0.36
		88	0.34 ± 0.79
		86	0.00
			Deep vein thrombosis
		79	0.52 ± 0.71
		86	0.75 ± 0.63
		87	0.68 ± 0.65
		88	0.44 ± 0.78
		88	0.38 ± 1.06
		88	0.52 ± 1.28
		86	0.06 ± 0.13

Table G27. Evidence of the association between nurse skill mix (proportion of registered nurses) and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes Source to Measure Nurse Skill Mix, Definition of Nurse Skill Mix	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Langemo[41] % of patients who had a pressure ulcer on a given day to all patients assessed for a pressure ulcer, pressure ulcers that occurred post admission were documented as hospital-acquired. Number of productive hours worked by RN divided by total staff hours.	Hospitals 1	% RN Medical-surgical units in hospitals with <100 beds 53.4 ICU in hospitals with 200-299 beds 99.4 ICU units in hospitals <100 beds 60.6 Medical-surgical units in hospitals with 200-299 beds 61.5	Rate, % 4.10 0.00 13.10 0.00
Lichtig[63] Likely adverse patient outcomes of the hospital stay, secondary diagnoses of urinary tract infection, pneumonia, pressure ulcers, infection in surgical patients. RN hours as a percentage of total nursing hours per nursing intensity weight-adjusted patient day	Hospitals Unit 352 Surgical 295 Surgical 126 Surgical 131 Surgical	Increase by 1% in proportion of RNs: California, 1992 California, 1994 New York,1992 New York, 1994 California, 1992 California, 1994 California, 1992 California, 1994 New York,1992 New York, 1994	Rate, % Pressure ulcers -0.79 -1.23 -1.77 -1.23 Pneumonia -0.56 -0.39 Surgical wound infections -0.53 -0.47 Relative risk of UTI, pneumonia, pressure ulcers, and SWI: Not significant
Needleman[28] Urinary tract infection in discharge abstract as secondary diagnosis; acute gastric ulcer, duodenal ulcer, peptic ulcer, gastrojejunal ulcer, hemorrhagic gastritis, erosive gastritis, unspecified GI-hemorrhage, esophageal hemorrhage coded in discharge abstract as secondary diagnosis; aspiration pneumonia, postoperative	Hospitals Patients 4,156 Medical 4,156 Surgical 4,156 Medical 4,156 Surgical 3,357 Medical 3,357 Medical 3,357 Surgical 3,357 Surgical 256 Medical	 Increase by 1% in RNs/total nursing hours Increase by 1% in RNs/total nursing hours increase by 1% of RN hours/total licensed hours Increase by 1% in RN hours/total licensed hours Increase by 1% in RN hours/total licensed hours Increase by 1% in RN hours/total nurse hours Increase by 1% in RN hours/licensed hours Increase by 1% in RN hours/total nursing hours Increase by 1% in RN hours/total nursing hours, hospital level analysis, California hospitals Increase by 1% of RN hours/total licensed hours, hospital	Relative risk Urinary tract infection 0.40 0.29 0.55 0.58 0.36 0.96 0.48 0.38 0.61 0.67 0.46 0.98 0.77 0.68 0.86 0.46 0.34 0.63 0.89 0.74 1.07 1.02 0.73 1.44 0.33 0.18 0.61 0.44 0.28 0.70

Table G27. Evidence of the association between nurse skill mix (proportion of registered nurses) and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes Source to Measure Nurse Skill Mix, Definition of Nurse Skill Mix	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions		Nurse Staffing Categories	Patient Outcomes		
pneumonia, hypostatic	256	Medical	level analysis, California hospitals			
pneumonia, bacterial			Increase by 1% in RN hours/total nursing hours, unit level	0.50	0.30	0.84
pneumonia, bronchopneumonia	256	Medical	analysis, California hospitals			
coded in discharge abstract as			Increase by 1% of RN hours/licensed hours, unit level	0.60	0.41	0.87
secondary diagnosis; cardiac	256	Medical	analysis, California hospitals			
arrest; shock without mention			Increase by 1% in RN hours/total nursing hours, hospital	0.82	0.47	1.44
of trauma; cardiogenic shock;	256	Surgical	level analysis, California hospitals			
respiratory arrest,			Increase by 1% in RN hours/licensed hours, hospital level	0.64	0.30	1.37
nonmechanical methods of	256	Surgical	analysis, California hospitals			
resuscitation, cardiopulmonary			Increase by 1% in RN hours/total nursing hours, California	0.09	0.01	0.91
resuscitation, failure to rescue:	256	Surgical	hospitals			
death in patients with sepsis,			Increase by 1% in RN hours/licensed hours, unit level	0.05	0.00	1.54
pneumonia, gastrointestinal	256	Surgical	analysis, California hospitals			
bleeding, shock or deep vein	799	Medical	1% increase in RN hours/total licensed hours	0.49	0.37	0.61
thrombosis coded in discharge	799	Surgical	1% increase in RN hours/total licensed hours	0.88	0.71	1.04
abstract as secondary	799	Surgical	1% increase in RN hours/total licensed hours	0.68	0.40	0.95
diagnosis; pressure ulcers,	799	Surgical	1% increase in RN hours/total licensed hours	0.59	0.36	0.82
posttraumatic surgical wound	799	Medical	1% increase in RN hours/total licensed hours	0.76	0.67	0.85
infection and postoperative	799	Medical	1% increase in RN hours/total licensed hours	0.54	0.41	0.66
surgical wound infection; % of	799	Medical	1% increase in RN hours/total licensed hours	0.48	0.38	0.61
RN hours/total nursing hours;	799	Surgical	1% increase in proportion of RN/total nursing personnel	0.67	0.46	0.98
% of licensed hours/total				Gastrointestinal bleeding		
nursing hours	4156	Medical	Increase by 1% in RN/total nursing hours	0.52	0.35	0.77
	4156	Surgical	Increase by 1% in RN/total nursing hours	0.41	0.19	0.86
	4156	Medical	increase by 1% of RN hours/total licensed hours	0.59	0.44	0.80
	4156	Surgical	Increase by 1% in RN hours/total licensed hours	0.56	0.31	1.01
	3,357	Medical	Increase by 1% in RN hours/total licensed hours	0.83	0.71	0.98
	3,357	Medical	Increase by 1% in RN hours/total nurse hours	0.49	0.32	0.76
	3357	Surgical	Increase by 1% in RN hours/licensed hours	0.94	0.76	1.16
	3357	Surgical	Increase by 1% in RN hours/total nursing hours	0.23	0.10	0.53
			Increase by 1% in RN hours/total nursing, hospital level	0.44	0.22	0.86
	256	Medical	analysis, California hospitals			
			Increase by 1% of RN hours/total licensed hours, hospital	0.52	0.32	0.87
	256	Medical	level analysis, California hospitals			
			Increase by 1% in RN hours/total nursing hours, unit level	1.02	0.72	1.44
	256	Medical	analysis, California hospitals			
			Increase by 1% of RN h/licensed hours, unit level analysis,	0.69	0.47	1.03
	256	Medical	California hospitals			

Table G27. Evidence of the association between nurse skill mix (proportion of registered nurses) and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes Source to Measure Nurse Skill Mix, Definition of Nurse Skill Mix	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions		Nurse Staffing Categories	Patient Outcomes		
	256	Surgical	Increase by 1% in RN h/total nursing hours, hospital level analysis, California hospitals	0.61	0.30	1.23
	256	Surgical	Increase by 1% in RN hours/licensed hours, hospital level analysis, California hospitals	0.66	0.26	1.69
	256	Surgical	Increase by 1% in RN hours/total nursing hours, California hospitals	0.78	0.40	1.52
	256	Surgical	Increase by 1% in RN hours/licensed hours, unit level analysis, California hospitals	0.79	0.37	1.71
	799	Medical	1% increase in RN hours/total licensed hours	0.61	0.42	0.79
	799	Surgical	1% increase in RN hours/total licensed hours	0.94	0.74	1.13
	799	Surgical	1% increase in RN hours/total licensed hours	0.36	0.12	0.59
	799	Surgical	1% increase in RN hours/total licensed hours	0.52	0.20	0.84
	799	Medical	1% increase in RN hours/total licensed hours	0.83	0.70	0.96
	799	Medical	1% increase in RN hours/total licensed hours	0.59	0.39	0.78
	799	Medical	1% increase in RN hours/total licensed hours	0.59	0.44	0.80
				Pneumonia		
	4156	Medical	Increase by 1% in RN/total nursing hours	0.52	0.35	0.77
	4156	Surgical	Increase by 1% in RN/total nursing hours	0.41	0.19	0.86
	4156	Medical	increase by 1% of RN hours/total licensed hours	0.59	0.44	0.80
	4156	Surgical	Increase by 1% in RN hours/total licensed hours	0.56	0.31	1.01
	3,357	Medical	Increase by 1% in RN hours/total licensed hours	0.83	0.71	0.98
	3,357	Medical	Increase by 1% in RN hours/total nurse hours	0.49	0.32	0.76
	3357	Surgical	Increase by 1% in RN hours/licensed hours	0.94	0.76	1.16
	3357	Surgical	Increase by 1% in RN hours/total nursing hours	0.23	0.10	0.53
	256	Medical	Increase by 1% in RN hours/total nursing, hospital level analysis, California hospitals	0.44	0.22	0.86
	256	Medical	Increase by 1% of RN h/total licensed hours, hospital level analysis, California hospitals	0.52	0.32	0.87
	256	Medical	Increase by 1% in RN hours/total nursing hours, unit level analysis, California hospitals	1.02	0.72	1.44
	256	Medical	Increase by 1% of RN hours/licensed hours, unit level analysis, California hospitals	0.69	0.47	1.03
	256	Surgical	Increase by 1% in RN h/total nursing hours, hospital level analysis, California hospitals	0.61	0.30	1.23
	256	Surgical	Increase by 1% in RN hours/licensed hours, hospital level analysis, California hospitals	0.66	0.26	1.69
	256	Surgical	Increase by 1% in RN hours/total nursing hours, California hospitals	0.78	0.40	1.52

Table G27. Evidence of the association between nurse skill mix (proportion of registered nurses) and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes Source to Measure Nurse Skill Mix, Definition of Nurse Skill Mix	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions		Nurse Staffing Categories	Patient Outcomes		
	256	Surgical	Increase by 1% in RN hours/licensed hours, unit level analysis, California hospitals	0.79	0.37	1.71
	799	Medical	1% increase in RN hours/total licensed hours	0.94	0.74	1.13
	799	Surgical	1% increase in RN hours/total licensed hours	0.36	0.12	0.59
	799	Surgical	1% increase in RN hours/total licensed hours	0.52	0.20	0.84
	799	Surgical	1% increase in RN hours/total licensed hours	0.83	0.70	0.96
	799	Medical	1% increase in RN hours/total licensed hours	1.00	0.99	1.01
	799	Medical	1% increase in RN hours/total licensed hours	0.59	0.39	0.78
	799	Medical	1% increase in RN hours/total licensed hours	0.59	0.44	0.80
				Shock		
	4156	Medical	Increase by 1% in RN/total nursing hours	0.84	0.71	0.99
	4156	Surgical	Increase by 1% in RN/total nursing hours	1.08	0.60	1.96
	4156	Medical	increase by 1% of RN hours/total licensed hours	0.46	0.27	0.81
	4156	Surgical	Increase by 1% in RN hours/total licensed hours	0.54	0.28	1.04
	3,357	Medical	Increase by 1% in RN hours/total licensed hours	0.66	0.50	0.87
	3,357	Medical	Increase by 1% in RN hours/total nurse hours	0.52	0.31	0.89
	3357	Surgical	Increase by 1% in RN hours/licensed hours	0.59	0.44	0.78
	3357	Surgical	Increase by 1% in RN hours/total nursing hours	0.36	0.14	0.93
	256	Medical	Increase by 1% in RN hours/total nursing, hospital level analysis, California hospitals	0.30	0.12	0.72
	256	Medical	Increase by 1% of RN hours/total licensed hours, hospital level analysis, California hospitals	0.20	0.08	0.53
	256	Medical	Increase by 1% in RN hours/total nursing hours, unit level analysis, California hospitals	0.34	0.16	0.75
	256	Medical	Increase by 1% of RN hours/licensed hours, unit level analysis, California hospitals	0.40	0.19	0.86
	256	Surgical	Increase by 1% in RN hours/total nursing hours, hospital level analysis, California hospitals	0.14	0.05	0.43
	256	Surgical	Increase by 1% in RN hours/licensed hours, hospital level analysis, California hospitals	0.22	0.09	0.57
	256	Surgical	Increase by 1% in RN hours/total nursing hours, California hospitals	0.17	0.06	0.47
	256	Surgical	Increase by 1% in RN hours/licensed hours, unit level analysis, California hospitals	0.27	0.12	0.61
	799	Medical	1% increase in RN hours/total licensed hours	0.59	0.42	0.76
	799	Surgical	1% increase in RN hours/total licensed hours	0.42	0.10	0.74
	799	Surgical	1% increase in RN hours/total licensed hours	0.60	0.19	1.00
	799	Surgical	1% increase in RN hours/total licensed hours	0.66	0.48	0.85

Table G27. Evidence of the association between nurse skill mix (proportion of registered nurses) and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes Source to Measure Nurse Skill Mix, Definition of Nurse Skill Mix	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions		Nurse Staffing Categories	Patient Outcomes		
	799	Medical	1% increase in RN hours/total licensed hours	1.00	0.97	1.02
	799	Medical	1% increase in RN hours/total licensed hours	0.40	0.18	0.63
	799	Medical	1% increase in RN hours/total licensed hours	0.46	0.27	0.81
				Failure to rescue		
	4156	Medical	Increase by 1% in RN/total nursing hours	0.85	0.70	1.03
	4156	Surgical	Increase by 1% in RN/total nursing hours	0.64	0.44	0.92
	4156	Medical	increase by 1% of RN hours/total licensed hours	0.81	0.66	1.00
	4156	Surgical	Increase by 1% in RN hours/total licensed hours	0.73	0.49	1.09
	3,357	Medical	Increase by 1% in RN hours/total licensed hours	0.90	0.80	1.01
	3,357	Medical	Increase by 1% in RN hours/total nurse hours	0.85	0.70	1.04
	3357	Surgical	Increase by 1% in RN hours/licensed hours	0.82	0.70	0.96
	3357	Surgical	Increase by 1% in RN hours/total nursing hours	0.69	0.45	1.06
	256	Medical	Increase by 1% in RN hours/total nursing , hospital level analysis, California hospitals	0.63	0.47	0.84
	256	Medical	Increase by 1% of RN hours/total licensed hours, hospital level analysis, California hospitals	0.58	0.40	0.86
	256	Medical	Increase by 1% in RN hours/total nursing hours, unit level analysis, California hospitals	0.70	0.54	0.90
	256	Medical	Increase by 1% of RN hours/licensed hours, unit level analysis, California hospitals	0.69	0.50	0.95
	256	Surgical	Increase by 1% in RN hours/total nursing hours, hospital level analysis, California hospitals	0.36	0.14	0.89
	256	Surgical	Increase by 1% in RN hours/licensed hours, hospital level analysis, California hospitals	0.45	0.22	0.92
	256	Surgical	Increase by 1% in RN hours/total nursing hours, California hospitals	0.44	0.20	0.96
	256	Surgical	Increase by 1% in RN hours/licensed hours, unit level analysis, California hospitals	0.54	0.30	0.99
	799	Medical	1% increase in RN hours/total licensed hours	0.80	0.64	0.97
	799	Surgical	1% increase in RN hours/total licensed hours	0.81	0.68	0.94
	799	Surgical	1% increase in RN hours/total licensed hours	0.70	0.37	1.03
	799	Surgical	1% increase in RN hours/total licensed hours	0.72	0.42	1.01
	799	Medical	1% increase in RN hours/total licensed hours	0.90	0.80	1.00
	799	Medical	1% increase in RN hours/total licensed hours	1.00	1.00	1.01
	799	Medical	1% increase in RN hours/total licensed hours	0.81	0.64	0.99
	799	Surgical	1% increase in proportion of RN/total nursing personnel	0.81	0.66	1.00

Table G27. Evidence of the association between nurse skill mix (proportion of registered nurses) and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes Source to Measure Nurse Skill Mix, Definition of Nurse Skill Mix	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Potter[40] (Number of falls on a unit/number of patient days) * 1,000	Hospitals 1 Unit ICU Patients Medical	% RN 53.8 55.4 56.2 57.1	Falls, rate/100 patient days 0.30 0.29 0.30 0.23
Ritter-Teitel[69] Hospital Incidence reports; % of patients with urinary tract infection not presented at admission among total discharged or sampled patients; % of patients with pressure ulcers, number of events/1,000 patient days, % of RNs among total nursing personnel	Hospitals 28	% RN 56.15 56.4 56.79 56.77 56.79 56.77 Increase by 1 hour in RN hours % RN 56.15 56.4 56.79 56.77 56.79 56.77 Increase by 1 hour in RN hours % RN 56.15 56.4 56.79 56.77 56.79 56.77 Increase by 1 hour in RN hours Increase by 1 hour in RN hours in medical units Increase by 1 hour in RN hours in surgical units	Rate %, ± SD 2.09 ± 2.25 2.53 ± 2.29 2.25 ± 2.36 2.61 ± 2.46 1.93 ± 2.18 2.45 ± 2.16 -0.18 ± 1.24 Pressure ulcers 2.42 ± 2.10 2.06 ± 1.66 2.33 ± 2.12 2.23 ± 1.94 2.50 ± 2.11 1.88 ± 1.33 -0.24 ± 1.18 Falls 0.32 ± 0.20 0.34 ± 0.16 0.40 ± 0.21 0.41 ± 0.17 0.24 ± 0.14 0.27 ± 0.12 -0.42 ± 0.90 -0.49 ± 0.87 -0.15 ± 0.96
Seago[8] The proportion of pressure ulcers per patient day; the proportion of falls per patient day; RN hours/total hours.	Hospitals 1 Unit Combined Patients Medical	% RN 63 61.5 62	Rate, % Falls Pressure ulcers 0.29 0.24 0.27 0.18 0.23 0.29

Table G27. Evidence of the association between nurse skill mix (proportion of registered nurses) and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes Source to Measure Nurse Skill Mix, Definition of Nurse Skill Mix	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Seago[93] The proportion of pressure ulcers per patient day, the proportion of falls per patient day, RN hours/total hours	Hospitals 1 Unit Combined Patients Medical	 % RN 75 96 72 75 96 72	Rate/100patient days ± SD Decubitus ulcers 0.78 ± 0.09 0.02 ± 0.05 0.05 ± 0.08 Falls 0.35 ± 0.20 0.19 ± 0.19 0.45 ± 0.25
Simmonds[82] % of patients with positive colonization of vancomycin-resistant enterococci 48 hours after admission to the hospital and after surgery; 100% of nursing care provided by a licensed practical nurse	Hospitals 1 Unit Specialty Patients Medical Age 68.75 Sex 55.8	% RN 76.83 75.51 74.19 72.87 76.83 75.51 74.19 72.87	Rate, % Nosocomial infection 1.61 3.29 4.97 6.65 2.87 3.73 4.59 1.79
Stratton[91] Rate/1,000 patient days of respiratory, gastrointestinal, bloodstream and central line infections in hospitalized patients not present at time of admission; rate/1,000 patient days of bloodstream and central line infections in hospitalized patients not present at time of admission. average % of RN productive hours/total nursing hours/ patient day	Hospitals 7 Unit Patients Combined Combined Combined Combined Combined Combined Combined Combined Spec Surgical Spec Surgical Spec Surgical Spec Surgical ICU Medical ICU Medical ICU Medical ICU Medical Combined Medical Combined Medical Combined Medical Combined Medical Combined Medical	% RN 73.41 72.06 72.41 74 83.2 79 79.6 80.2 89 88.17 87.5 88.5 80.35 78.76 78.79 80.03 Increase by 1 hour in total nursing hours	Rate/100 patient days ± SD Nosocomial infections 0.75 ± 0.69 0.53 ± 0.67 0.71 ± 0.77 0.64 ± 0.43 0.65 ± 0.23 0.62 ± 0.39 0.71 ± 0.59 0.85 ± 0.50 0.73 ± 0.56 1.03 ± 0.96 0.80 ± 0.69 0.95 ± 0.71 0.51 ± 0.08 0.79 ± 0.17 0.66 ± 0.12 0.56 ± 0.17 0.01 ± 0.03

Table G27. Evidence of the association between nurse skill mix (proportion of registered nurses) and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes Source to Measure Nurse Skill Mix, Definition of Nurse Skill Mix	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
	Combined Medical Combined Medical Combined Medical	Increase by 1% in RN hours increase by 1% in overtime RN hours Increase by 1% in temporary nurses	0.00 ± 0.01 -0.01 ± 0.02 0.00 ± 0.01
Tallier[83] Incidence rate/1,000 patient days of pressure ulcers developed 72 hours after admission, % of productive hours in direct patient care worked by RN	Hospitals 1 Unit Combined Patients Medical	% RN 57 60	Rate/100 patient days Pressure ulcers 0.17 0.29
Unruh[81] Yearly number of occurrences of pneumonia, falls, and decubitus ulcers per hospital	Hospitals 1477 Unit Combined Patients Medical	 1% increase in proportion of licensed nurses/total nursing personnel 1% increase in proportion of licensed nurses/total nursing personnel 1% increase in proportion of licensed nurses/total nursing personnel	Relative risk Pneumonia 0.99 Decubitus ulcers 0.98 Falls 1.03
Unruh[66] Nosocomial urinary tract infection as secondary diagnosis when primary diagnosis is not disorders of kidneys, urinary and reproductive tracts and systems; hospital acquired pneumonia as secondary diagnosis when primary diagnosis is not respiratory disorders and adult atelectasis; secondary diagnosis of decubitus ulcer in patients not transferred from another hospital; falls in hospital when a primary diagnosis was not fracture or injury; adult	Hospitals 211 Unit Combined Patients Combined Race 45.37 Sex 42.43	% RN 68.5 69.2 70.2 71.2 71.5 71.4 71.8 70 63 70 63 Increase by 1% in RN proportion Increase by 1% in RN proportion in small hospitals Increase by 1% in RN proportion in medium hospitals Increase by 1% in RN proportion in large hospitals 68.5	Decubitus ulcer, rate % 0.55 0.49 0.53 0.69 0.67 0.73 0.73 0.68 0.78 0.69 0.75 -0.00090 -0.00070 -0.00120 0.00010 Surgical wound infections 0.29

Table G27. Evidence of the association between nurse skill mix (proportion of registered nurses) and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes Source to Measure Nurse Skill Mix, Definition of Nurse Skill Mix	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
atelectasis as secondary diagnosis when primary diagnosis is not respiratory disorders, secondary diagnosis of post surgical infections; cardiac arrest as secondary diagnosis when primary diagnosis is not circulatory disorder, % of RN FTE/total nurses FTE		69.2	0.26
		70.2	0.24
		71.2	0.28
		71.5	0.28
		71.4	0.31
		71.8	0.30
		70	0.27
		63	0.28
		70	0.30
		63	0.31
		Increase by 1% in RN proportion	0.00
		Increase by 1% in RN proportion in small hospitals	0.00
		Increase by 1% in RN proportion in medium hospitals	0.00
		Increase by 1% in RN proportion in large hospitals	0.00
			Pneumonia
		68.5	0.98
		69.2	0.91
		70.2	0.96
		71.2	1.54
		71.5	1.55
		71.4	1.63
		71.8	1.64
		Increase by 1% in RN proportion	-0.00090
		Increase by 1% in RN proportion in small hospitals	-0.00220
		Increase by 1% in RN proportion in medium hospitals	-0.00050
		Increase by 1% in RN proportion in large hospitals	-0.00030
			Falls
		68.5	0.04
		69.2	0.04
		70.2	0.16
		71.2	0.91
		71.5	0.86
		71.4	0.74
		71.8	0.72
		Increase by 1% in RN proportion	0.00010
		Increase by 1% in RN proportion in small hospitals	0.00050
		Increase by 1% in RN proportion in medium hospitals	-0.00030
		Increase by 1% in RN proportion in large hospitals	0.00010

Table G27. Evidence of the association between nurse skill mix (proportion of registered nurses) and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes Source to Measure Nurse Skill Mix, Definition of Nurse Skill Mix	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
			Pulmonary failure
		68.5	0.52
		69.2	0.46
		70.2	0.47
		71.2	0.63
		71.5	0.68
		71.4	0.70
		71.8	0.69
		Increase by 1% in RN proportion	-0.00030
		Increase by 1% in RN proportion in small hospitals	0.00010
		Increase by 1% in RN proportion in medium hospitals	-0.00060
		Increase by 1% in RN proportion in large hospitals	0.00070
			CPR
		68.5	0.54
		69.2	0.48
		70.2	0.50
		71.2	0.61
		71.5	0.64
		71.4	0.63
		71.8	0.60
		Increase by 1% in RN proportion	0.00
		Increase by 1% in RN proportion in small hospitals	0.00
		Increase by 1% in RN proportion in medium hospitals	0.00
		Increase by 1% in RN proportion in large hospitals	0.00
			Pressure ulcers
		Increase by 1% in RN proportion	-0.00010
		Increase by 1% in RN proportion in small hospitals	-0.00020
		Increase by 1% in RN proportion in medium hospitals	0.00001
		Increase by 1% in RN proportion in large hospitals	-0.00010
Wan[52] Incidence/1,000 patient days of falls adjusted for severity of incident, RN hours/total nursing hours	Hospitals 45 Unit Combined Patients Combined	Increase by 1% of RNs/total nursing hours 52% of RNs	Falls, rate/100 patient days -0.05 0.31 ± 0.05

Table G27. Evidence of the association between nurse skill mix (proportion of registered nurses) and patient outcomes (continued)

Author, Source to Measure Patient Outcomes, Definition of Patient Outcomes Source to Measure Nurse Skill Mix, Definition of Nurse Skill Mix	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Zidek[85] New incidence of skin breakdown acquired over the course of the hospital stay; number of reported unplanned descents to the floor during the course of the hospital stay. % of RN FTE/total nursing FTE	Hospitals 1 Unit Combined Patients Medical-surgical	% RN 31 31 28 32 30 30 31 33 32 31 33 30	Rate, % Falls Pressure ulcer 0.59 0.18 0.45 0.05 0.83 0.26 0.52 0.09 0.28 0.00 0.25 0.06 0.23 0.17 0.63 0.37 0.61 0.09 0.62 0.24 0.66 0.18 0.66 0.11

BSN = Bachelor of Science in Nursing; CPR = Cardio Pulmonary Resuscitation; DRG = Diagnosis Related Group; HPF = high-powered field; ICU = Intensive Care Unit; LPN = Licensed Practical Nurse; NS = Not Significant; RN = Registered Nurse; SD = Standard Deviation; SWI = Surgical Wound Infection; UTI = Urinary Tract Infection

Table G28. Relative risk of patient outcomes corresponding to an increase by 1% of RNs in nurse skill mix as reported by authors

Author	Data	Analytic Unit	Hospitals	Unit	Patients	Outcomes	Relative Risk	95% CI
Needleman[28]	Administrative	Hospital	4,156	Medical	Medical	Urinary tract infection	0.40	0.29; 0.55
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	Urinary tract infection	0.58	0.36; 0.96
Needleman[28]	Administrative	Hospital	3,357	Medical	Medical	Urinary tract infection	0.46	0.34; 0.63
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	Urinary tract infection	1.02	0.73; 1.44
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Urinary tract infection	0.33	0.18; 0.61
Needleman[28]	Administrative	Unit	256	Medical	Medical	Urinary tract infection	0.50	0.30; 0.84
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	Urinary tract infection	0.82	0.47; 1.44
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	Urinary tract infection	0.09	0.01; 0.91
Needleman[29]	Administrative	Hospital	799	Combined	Surgical	Urinary tract infection	0.67	0.46; 0.98
Hope[86]	Administrative	Patient	1	Combined	Medical	Urinary tract infection	1.01	1.00; 1.01
Needleman[28]	Administrative	Hospital	4,156	Medical	Medical	Gastrointestinal bleeding	0.60	0.36; 0.97
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	Gastrointestinal bleeding	0.45	0.18; 1.11
Needleman[28]	Administrative	Hospital	3,357	Medical	Medical	Gastrointestinal bleeding	0.81	0.58; 1.12
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	Gastrointestinal bleeding	0.27	0.09; 0.78
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Gastrointestinal bleeding	0.89	0.52; 1.53
Needleman[28]	Administrative	Unit	256	Medical	Medical	Gastrointestinal bleeding	0.93	0.56; 1.55
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	Gastrointestinal bleeding	0.02	0.00; 0.51
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	Gastrointestinal bleeding	0.04	0.00; 0.64
Needleman[28]	Administrative	Hospital	4,156	Medical	Medical	Pneumonia	0.52	0.35; 0.77
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	Pneumonia	0.41	0.19; 0.86
Needleman[28]	Administrative	Hospital	3,357	Medical	Medical	Pneumonia	0.49	0.32; 0.76
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	Pneumonia	0.23	0.10; 0.53
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Pneumonia	0.44	0.22; 0.86
Needleman[28]	Administrative	Unit	256	Medical	Medical	Pneumonia	1.02	0.72; 1.44
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	Pneumonia	0.61	0.30; 1.23
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	Pneumonia	0.78	0.40; 1.52
Hope[86]	Administrative	Patient	1	Combined	Medical	Pneumonia	1.06	0.93; 1.21
Needleman[28]	Administrative	Hospital	4,156	Medical	Medical	Shock	0.84	0.71; 0.99
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	Shock	1.08	0.60; 1.96
Needleman[28]	Administrative	Hospital	3,357	Medical	Medical	Shock	0.52	0.31; 0.89
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	Shock	0.36	0.14; 0.93
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Shock	0.30	0.12; 0.72
Needleman[28]	Administrative	Unit	256	Medical	Medical	Shock	0.34	0.16; 0.75
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	Shock	0.14	0.05; 0.43
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	Shock	0.17	0.06; 0.47
Needleman[28]	Administrative	Hospital	4,156	Medical	Medical	Failure to rescue	0.85	0.70; 1.03
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	Failure to rescue	0.64	0.44; 0.92
Needleman[28]	Administrative	Hospital	3,357	Medical	Medical	Failure to rescue	0.85	0.70; 1.04
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	Failure to rescue	0.69	0.45; 1.06

Table G28. Relative risk of patient outcomes corresponding to an increase by 1% of RNs in nurse skill mix as reported by authors (continued)

Author	Data	Analytic Unit	Hospitals	Unit	Patients	Outcomes	Relative Risk	95% CI
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Failure to rescue	0.63	0.47; 0.84
Needleman[28]	Administrative	Unit	256	Medical	Medical	Failure to rescue	0.70	0.54; 0.90
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	Failure to rescue	0.36	0.14; 0.89
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	Failure to rescue	0.44	0.20; 0.96
Needleman[29]	Administrative	Hospital	799	Combined	Surgical	Failure to rescue	0.73	0.49; 1.09
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	Pulmonary failure	0.94	0.56; 1.56
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	Pulmonary failure	0.76	0.43; 1.34
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	Pulmonary failure	0.81	0.41; 1.60
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	Pulmonary failure	0.86	0.46; 1.59
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	Pressure ulcers	0.44	0.23; 0.86
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Pressure ulcers	0.27	0.09; 0.83
Needleman[28]	Administrative	Unit	256	Medical	Medical	Pressure ulcers	0.65	0.36; 1.17
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	Pressure ulcers	0.01	0.00; 0.29
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	Pressure ulcers	0.00	0.00; 0.11
Hope[86]	Administrative	Patient	1	Combined	Combined	Nosocomial infections	1.06	1.03; 1.09
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	Surgical wound infection	1.03	0.66; 1.60
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	Surgical wound infection	1.31	0.73; 2.38
Hope[86]	Administrative	Patient	1	Combined	Surgical	Surgical wound infection	1.03	0.99; 1.08
Needleman[28]	Administrative	Hospital	3,357	Medical	Medical	Deep vein thrombosis	1.05	0.64; 1.71
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	Deep vein thrombosis	1.39	0.66; 2.91
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Deep vein thrombosis	0.78	0.39; 1.57
Needleman[28]	Administrative	Unit	256	Medical	Medical	Deep vein thrombosis	0.75	0.40; 1.40
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	Deep vein thrombosis	1.55	0.51; 4.76
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	Deep vein thrombosis	1.87	0.69; 5.04
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	Complications	3.06	0.94; 10.03
Needleman[28]	Administrative	Hospital	3,357	Medical	Medical	Complications	18.55	1.22; 281.24
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	Complications	1.68	0.66; 4.27
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Complications	0.68	0.29; 1.58
Needleman[28]	Administrative	Unit	256	Medical	Medical	Complications	0.74	0.32; 1.68
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	Complications	0.57	0.17; 1.91
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	Complications	0.71	0.20; 2.48
Needleman[28]	Administrative	Hospital	4,156	Medical	Medical	Sepsis	1.55	0.93; 2.61
Needleman[28]	Administrative	Hospital	4,156	Surgical	Surgical	Sepsis	1.15	0.72; 1.84
Needleman[28]	Administrative	Hospital	3,357	Medical	Medical	Sepsis	0.83	0.56; 1.22
Needleman[28]	Administrative	Hospital	3,357	Surgical	Surgical	Sepsis	0.74	0.43; 1.28
Needleman[28]	Administrative	Hospital	256	Medical	Medical	Sepsis	1.08	0.61; 1.91
Needleman[28]	Administrative	Unit	256	Medical	Medical	Sepsis	1.03	0.61; 1.75
Needleman[28]	Administrative	Hospital	256	Surgical	Surgical	Sepsis	0.00	0.00; 0.85
Needleman[28]	Administrative	Unit	256	Surgical	Surgical	Sepsis	0.99	0.51; 1.92
Hope[86]	Administrative	Patient	1	Combined	Medical	Sepsis	1.05	1.04; 1.07

Table G29. Evidence of the association between nurse strategies (overtime hours, temporary nurse hours, full-time hours) and patient outcomes

Author, Definition of Patient Outcomes, Definition of Nurse Strategies	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Alonso-Echanove[79]	Hospitals 6		Relative risk
Bloodstream infections as secondary	Unit ICU		Nosocomial infection
diagnosis after CVC, duration of CVC,	Patients Medical	Patients cared for by float nurse, days >60%	2.75 1.45 5.22
number of days from the placement	Race 61		
date to the day when bloodstream	Sex 54	Patients cared by float nurse, days >60%	2.61 1.21 5.59
infection occurred or to the day of		Patients cared for by float nurse, days <60%	1.00 1.00 1.00
CVC removal, % of temporary nurses/ float nurses in unit each day; float nurse = a nurse not permanently assigned to the participating ICU, agency nurses, and nurses from other units or hospital areas who had been working in the participating ICU less than a year			
Berney[84]	Hospitals 161		Relative risk
Actual number of events identified as	Unit Patients		Urinary tract infection
secondary DRG: urinary tract	Surgical Surgical	1% increase in RN overtime hours	1.01 0.99 1.02
infection, gastrointestinal bleeding,	Medical Medical	1st (low overtime) quartile 1.6%	1.00 0.99 1.01
pneumonia, shock, failure to rescue,	Medical Medical	4th (high overtime) quartile 7.4%	1.00 1.00 1.00
sepsis	Medical Medical	1% increase in RN overtime hours .00%	1.01 1.00 1.02
	Surgical Surgical	1st (low overtime) quartile 1.6%	1.01 0.99 1.02
	Surgical Surgical	4th (high overtime) quartile 7.4%	1.00 1.00 1.00
			Gastrointestinal bleeding
	Surgical Surgical	1% increase in RN overtime hours	1.02 0.99 1.05
	Medical Medical	1st (low overtime) quartile 1.6%	0.98 0.96 1.01
	Medical Medical	4th (high overtime) quartile 7.4%	1.00 1.00 1.00
	Medical Medical	1% increase in RN overtime hours .00%	1.01 0.98 1.03
	Surgical Surgical	1st (low overtime) quartile 1.6%	1.00 0.96 1.03
	Surgical Surgical	4th (high overtime) quartile 7.4%	1.00 1.00 1.00
			Pneumonia
	Surgical Surgical	1% increase in RN overtime hours	1.02 1.00 1.04
	Medical Medical	1st (low overtime) quartile 1.6%	1.01 0.99 1.02
	Medical Medical	4th (high overtime) quartile 7.4%	1.00 1.00 1.00
	Medical Medical	1% increase in RN overtime hours .00%	1.01 1.00 1.02
	Surgical Surgical	1st (low overtime) quartile 1.6%	1.01 0.99 1.04
	Surgical Surgical	4th (high overtime) quartile 7.4%	1.00 1.00 1.00
			Shock
	Surgical Surgical	1% increase in RN overtime hours	1.01 0.98 1.03
	Medical Medical	1st (low overtime) quartile 1.6%	1.01 0.99 1.03

Table G29. Evidence of the association between nurse strategies (overtime hours, temporary nurse hours, full-time hours) and patient outcomes (continued)

Author, Definition of Patient Outcomes, Definition of Nurse Strategies	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions		Nurse Staffing Categories		Patient Outcomes		
	Medical	Medical	4th (high overtime) quartile	7.4%	1.00	1.00	1.00
	Medical	Medical	1% increase in RN overtime hours	00%	1.02	1.00	1.04
	Surgical	Surgical	1st (low overtime) quartile	1.6%	1.00	0.98	1.02
	Surgical	Surgical	4th (high overtime) quartile	7.4%	1.00	1.00	1.00
					Failure to rescue		
	Surgical	Surgical	1% increase in RN overtime hours		1.00	0.99	1.01
	Medical	Medical	1st (low overtime) quartile	1.6%	1.00	0.99	1.00
	Medical	Medical	4th (high overtime) quartile	7.4%	1.00	1.00	1.00
	Medical	Medical	1% increase in RN overtime hours	.00%	1.00	1.00	1.01
	Surgical	Surgical	1st (low overtime) quartile	1.6%	1.00	0.99	1.01
	Surgical	Surgical	4th (high overtime) quartile	7.4%	1.00	1.00	1.00
					Sepsis		
	Surgical	Surgical	1% increase in RN overtime hours		1.02	1.00	1.04
	Medical	Medical	1st (low overtime) quartile	1.6%	1.01	0.99	1.02
	Medical	Medical	4th (high overtime) quartile	7.4%	1.00	1.00	1.00
	Medical	Medical	1% increase in RN overtime hours	.00%	1.03	1.01	1.04
	Surgical	Surgical	1st (low overtime) quartile	1.6%	1.02	1.00	1.03
	Surgical	Surgical	4th (high overtime) quartile	7.4%	1.00	1.00	1.00

Table G29. Evidence of the association between nurse strategies (overtime hours, temporary nurse hours, full-time hours) and patient outcomes (continued)

Author, Definition of Patient Outcomes, Definition of Nurse Strategies	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories		Patient Outcomes
Cho[30] ICD-9-CM for urinary tract infection, pressure ulcers, falls and injury, surgical wound infection, and sepsis; Contracted hours = productive nursing hours (direct care to patient) worked by nursing personnel contracted on a temporary basis. Contract hours * % of RN	Unit Patients Age Race Sex Severity	Combined Combined 67.9 79.3 48.9 49.7	% Contract hours 3.60 3.30 3.20 5.00 3.60 3.30 3.20 5.00 3.60 3.30 3.20 5.00 3.60 3.30 3.20 5.00 3.60 3.30 3.20 5.00	% of RN 76.5 68.1 72.4 72.7 76.5 68.1 72.4 72.7 76.5 68.1 72.4 72.7 76.5 68.1 72.4 72.7 76.5 68.1 72.4 72.7	Rate, % ± SD Urinary tract infection 2.50 ± 1.30 1.60 ± 1.40 2.00 ± 1.00 2.10 ± 1.80 Pneumonia 3.10 ± 1.90 2.70 ± 2.20 2.80 ± 1.30 2.80 ± 2.00 Falls 0.20 ± 0.20 0.20 ± 0.30 0.20 ± 0.20 0.10 ± 0.20 Pressure ulcers 0.10 ± 0.30 0.30 ± 0.60 0.30 ± 0.50 0.20 ± 0.40 Surgical wound infections 1.60 ± 1.00 1.10 ± 1.10 1.50 ± 0.70 1.10 ± 1.00 Sepsis 1.20 ± 0.70 0.80 ± 0.80 1.10 ± 0.60 1.00 ± 1.10

Table G29. Evidence of the association between nurse strategies (overtime hours, temporary nurse hours, full-time hours) and patient outcomes (continued)

Author, Definition of Patient Outcomes, Definition of Nurse Strategies	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Cimiotti[87] Infections occurring in an infant 48 hours or longer after admission to the NICU including bloodstream infections, device associated pneumonia, CNS and skin infections, conjunctivitis; hours/patient day worked by float pool and agency RN not regularly assigned to the NICU	Hospitals 1 Unit Neonatal Patients Medical	0.19% of float nurses 24.07% of float nurse 0.19% of float nurses 24.07% of float nurse Mean staffing levels 12.13% Low % of pooled nurses 14.19% High % of pooled nurses 12.13% Mean staffing levels 12.13% Low % of pooled nurses 14.19% High % of pooled nurses 12.13%	Rate, % Pneumonia Nosocomial infection 0.50 18.30 0.90 15.10 Sepsis 10.50 5.50 Relative risk Nosocomial infection Reference 1.30 1.30 Sepsis rate% 1.00 2.01 2.06
Donaldson[9] Total number of patients with Stage I-IV pressure ulcers regardless of whether ulcer was acquired during hospitalization or present on admission; % total number of surveyed patients; unplanned descent to the floor; rate/1,000 patient days, total number of productive hours worked only by those with direct patient care responsibilities who are contract staff (registry, travelers). It does not include internal float staff	Hospitals 68	% contract hours % RN 8.43 59.2 8.04 66.67 9.22 68.79 10.74 72.19	Rate/100 patient days ± SD 0.31 ± 0.20 0.32 ± 0.17 0.30 ± 0.22 0.26 ± 0.16
Donaldson[95] Hospital acquired pressure related skin injury controlling for date of admission, % of all patients on the day of prevalence study, patient's unplanned descent to the hospital floor; were analyzed as 7 day aggregate per unit; also actually number per unit; the number of falls/1,000 patient days, percent of contacted or agency staff.	Hospitals 25 Unit Combined Patients Medical	Increase by 1% contracted hours of care	Rate/100 patient days ± SD Falls -0.001 ± 0.01

Table G29. Evidence of the association between nurse strategies (overtime hours, temporary nurse hours, full-time hours) and patient outcomes (continued)

Author, Definition of Patient Outcomes, Definition of Nurse Strategies	Number of Hospitals, Units, Patient Age, % of Whites, % of Males, % of Emergency Admissions	Nurse Staffing Categories	Patient Outcomes
Potter[40] (Number of falls on a unit/number of patient days) * 1,000, an average % of float nurses in day shift provided by nurses from other units or outside the hospital	Hospitals 1 Unit ICU Patients Medical	% float hours % RN 7.30 53.8 11.00 55.4 8.80 56.2 10.10 57.1	Rate/100 patient days Falls 0.30 0.29 0.30 0.23
Robert[6] Primary bloodstream infections (BSIs) (CDC). Index date for cases, the day of 1 positive blood culture; for controls = (cases LOS before BSI/total cases LOS) * control total LOS, % of pool staff - not regular full-time employees of the hospital assigned to SICU.	Hospitals 1 Unit ICU Patients Surgical	% of contract hours 17.19 32.59 17.19 32.59	Nosocomial infection, rate/100 patient days 0.28 0.76 Relative risk 1.00 1.00 1.00 3.20 1.20 8.20
Stratton[91] Rate/1,000 patient days of respiratory, gastrointestinal, bloodstream and central line infections in hospitalized patients not present at time of admission, rate/1,000 patient days of bloodstream and central line infections in hospitalized patients not present at time of admission, % of total productive overtime nursing hours worked by RN, LPN, and UAP in each quarter 2002, % of RN productive hours worked by supplemental nurse staffing (total nursing overtime hours and percentages of hours from float/agency/traveler RN hours)	Hospitals 7	% hours overtime contract RN 18.06 14.05 73.41 17.59 13.91 72.06 17.59 14.03 72.41 14.71 11.53 74 17.20 17.95 83.2 16.20 17.53 79 17.20 17.93 79.6 16.80 18.08 80.2 16.92 12.72 89 15.67 12.03 88.17 15.92 11.67 87.5 16.58 12.52 88.5 4.08 14.04 80.35 3.84 13.67 78.76 4.00 13.64 78.79 3.52 12.68 80.03 Increase by 1% in overtime RN hours Increase by 1% in temporary nurses	Rate/100 patient days ± SD Nosocomial infection 0.75 ± 0.69 0.53 ± 0.67 0.71 ± 0.77 0.64 ± 0.43 0.65 ± 0.23 0.62 ± 0.39 0.71 ± 0.59 0.85 ± 0.50 0.73 ± 0.56 1.03 ± 0.96 0.80 ± 0.69 0.95 ± 0.71 0.51 ± 0.08 0.79 ± 0.17 0.66 ± 0.12 0.56 ± 0.17 -0.01 ± 0.02 0.00380 ± 0.01
Tourangeau[76] 30 day mortality, % of full time nurses	Hospitals 75 Unit Combined Patients Medical	% fulltime % RN 0.67 85 0.55 71 0.62 79	Rate, % 14.02 15.27 15.05

BSI = Bloodstream infection; CNS = Central nervous system; CVC = Central venous catheter DRG = Diagnosis related group; ICU = Intensive care unit; LOS = Length of stay; NISU = Neonatal intensive care unit; RN = Registered Nurse; SD = Standard deviation; SICU = Surgical intensive care unit

Table G30. The significant effect modification by the study design of the association between nurse staffing and patient outcomes

	Outcomes Rates (N=16)	Outcomes Relative Risk (N=19)
Quality scores	% **Significant interactions**	% **Significant interactions**
Patients/RN/shift	12.5	21.1
RN FTE/patient day	12.5	15.8
Patients/LPN	31.3	5.3
Total nurse hours	6.3	0
RN hours/patient day	12.5	21.1
LPN hours	31.3	0
UAP hours	6.3	0

References for Evidence Tables

1. Fridkin SK, Pear SM, Williamson TH, et al. The role of understaffing in central venous catheter-associated bloodstream infections. Infect Control Hosp Epidemiol Mar 1996;17(3):150-8.
2. Arnow P, Allyn PA, Nichols EM, et al. Control of methicillin-resistant Staphylococcus aureus in a burn unit: role of nurse staffing. J Trauma Nov 1982;22(11):954-9.
3. Marcin JP, Rutan E, Rapetti PM, et al. Nurse staffing and unplanned extubation in the pediatric intensive care unit. Pediatr Crit Care Med May 2005;6(3):254-7.
4. Aiken LH, Sloane DM, Sochalski J. Hospital organisation and outcomes. Qual Health Care Dec 1998;7(4):222-6.
5. Aiken LH, Sloane DM, Lake ET, et al. Organization and outcomes of inpatient AIDS care. Med Care Aug 1999;37(8):760-72.
6. Robert J, Fridkin SK, Blumberg HM, et al. The influence of the composition of the nursing staff on primary bloodstream infection rates in a surgical intensive care unit. Infect Control Hosp Epidemiol Jan 2000;21(1):12-7.
7. Aiken LH, Smith HL, Lake ET. Lower Medicare mortality among a set of hospitals known for good nursing care. Med Care Aug 1994;32(8):771-87.
8. Seago JA. Evaluation of a hospital work redesign: patient-focused care. J Nurs Adm Nov 1999;29(11):31-8.
9. Donaldson N, Bolton LB, Aydin C, et al. Impact of California's licensed nurse-patient ratios on unit-level nurse staffing and patient outcomes. Policy Polit Nurs Pract Aug 2005;6(3):198-210.
10. Grillo-Peck AM, Risner PB. The effect of a partnership model on quality and length of stay. Nurs Econ Nov-Dec 1995;13(6):367-72, 74.
11. Hartz AJ, Krakauer H, Kuhn EM, et al. Hospital characteristics and mortality rates. N Engl J Med Dec 21 1989;321(25):1720-5.
12. Krakauer H, Bailey RC, Skellan KJ, et al. Evaluation of the HCFA model for the analysis of mortality following hospitalization. Health Serv Res Aug 1992;27(3):317-35.
13. McDaniel C, Patrick T. Leadership, nurses, and patient satisfaction: a pilot study. Nurs Adm Q Spring 1992;16(3):72-4.
14. Halpine S, Maloney S. Tracing the missing link between nursing workload and case mix groups: a validation study. Healthc Manage Forum Fall 1993;6(3):19-26.
15. Shamian J, Hagen B, Hu TW, et al. The relationship between length of stay and required nursing care hours. J Nurs Adm Jul-Aug 1994;24(7-8):52-8.
16. Taunton RL, Kleinbeck SV, Stafford R, et al. Patient outcomes. Are they linked to registered nurse absenteeism, separation, or work load? J Nurs Adm Apr 1994;24(4 Suppl):48-55.
17. Dugan J, Lauer E, Bouquot Z, et al. Stressful nurses: the effect on patient outcomes. J Nurs Care Qual Apr 1996;10(3):46-58.
18. Bloom JR, Alexander JA, Nuchols BA. Nurse staffing patterns and hospital efficiency in the United States. Soc Sci Med Jan 1997;44(2):147-55.
19. Minnick AF, Roberts MJ, Young WB, et al. What influences patients' reports of three aspects of hospital services? Med Care Apr 1997;35(4):399-409.
20. Melberg SE. Effects of changing skill mix. Nurs Manage Nov 1997;28(11):47-8.
21. Leiter MP, Harvie P, Frizzell C. The correspondence of patient satisfaction and nurse burnout. Soc Sci Med Nov 1998;47(10):1611-7.
22. Kovner C, Gergen PJ. Nurse staffing levels and adverse events following surgery in U.S. hospitals. Image J Nurs Sch 1998;30(4):315-21.
23. Hoover KW. The impact of managed care penetration, hospital organizational variables and nurse staffing on hospital patient outcomes. Dissertation 2000;DAI-B 61/08, p. 4062, Feb 2001:AAT 9984608.
24. Gandjour A. The effect of managed care penetration on hospital staffing in Tennessee, 1991--1995. Manag Care Interface Sep 2000;13(9):62-6, 70.
25. Ridge RA. The relationship between patient satisfaction with nursing care and nurse staffing. Dissertation 2001;DAI-B 62/01, p. 165, Jul 2001:AAT 3000170.
26. Bolton LB, Jones D, Aydin CE, et al. A response to California's mandated nursing ratios. J Nurs Scholarsh 2001;33(2):179-84.
27. Aiken LH, Clarke SP, Sloane DM. Hospital restructuring: does it adversely affect care and outcomes? J Health Hum Serv Adm Spring 2001;23(4):416-42.
28. Needleman J. NURSE STAFFING AND PATIENT OUTCOMES IN HOSPITALS. Final Report for Health Resources Services Administration 2001;Contract No. 230990021.
29. Needleman J, Buerhaus P, Mattke S, et al. Nurse-staffing levels and the quality of care in hospitals. N Engl J Med May 30 2002;346(22):1715-22.
30. Cho S-H. Nurse staffing and adverse patient outcomes. Dissertation 2002;DAI-B 63/02, p. 735, Aug 2002:AAT 3042055.
31. Oster CAH. The relationships between emergency department staffing and clinical outcomes of the acute myocardial infarction patient. Dissertation 2002;DAI-B 63/03, p. 1272, Sep 2002:AAT 3045751.
32. Cheung RB. The relationship between nurse staffing, nursing time, and adverse events in an acute care hospital. Dissertation 2002;DAI-B 63/05, p. 2301, Nov 2002:AAT 3052636.

33. Langemo DK, Anderson J, Volden CM. Nursing quality outcome indicators. The North Dakota Study. J Nurs Adm Feb 2002;32(2):98-105.
34. Seago JA, Ash M. Registered nurse unions and patient outcomes. J Nurs Adm Mar 2002;32(3):143-51.
35. Kovner C, Jones C, Zhan C, et al. Nurse staffing and postsurgical adverse events: an analysis of administrative data from a sample of U.S. hospitals, 1990-1996. Health Serv Res Jun 2002;37(3):611-29.
36. Whitman GR, Kim Y, Davidson LJ, et al. The impact of staffing on patient outcomes across specialty units. J Nurs Adm Dec 2002;32(12):633-9.
37. Beckman JAS. The effectiveness of nursing practice patterns in acute care nursing sub-units. Dissertation 2003;DAI-B 64/11, p. 5445, May 2004:AAT 3111973.
38. Cho SH, Ketefian S, Barkauskas VH, et al. The effects of nurse staffing on adverse events, morbidity, mortality, and medical costs. Nurs Res Mar-Apr 2003;52(2):71-9.
39. Aiken LH, Clarke SP, Cheung RB, et al. Educational levels of hospital nurses and surgical patient mortality. Jama Sep 24 2003;290(12):1617-23.
40. Potter P, Barr N, McSweeney M, et al. Identifying nurse staffing and patient outcome relationships: a guide for change in care delivery. Nurs Econ Jul-Aug 2003;21(4):158-66.
41. Langemo DK, Anderson J, Volden C. Uncovering pressure ulcer incidence. Nurs Manage Oct 2003;34(10):54-7.
42. Bolton LB, Aydin CE, Donaldson N, et al. Nurse staffing and patient perceptions of nursing care. J Nurs Adm Nov 2003;33(11):607-14.
43. Needleman J, Buerhaus PI, Mattke S, et al. Measuring hospital quality: can medicare data substitute for all-payer data? Health Serv Res Dec 2003;38(6 Pt 1):1487-508.
44. Vahey DC, Aiken LH, Sloane DM, et al. Nurse burnout and patient satisfaction. Med Care Feb 2004;42(2 Suppl):II57-66.
45. Sochalski J. Is more better?: the relationship between nurse staffing and the quality of nursing care in hospitals. Med Care Feb 2004;42(2 Suppl):II67-73.
46. Van Doren ES, Bowman J, Landstrom GL, et al. Structure and process variables affecting outcomes for heart failure clients. Lippincotts Case Manag Jan-Feb 2004;9(1):21-6.
47. Boyle SM. Nursing unit characteristics and patient outcomes. Nurs Econ May-Jun 2004;22(3):111-9, 23, 07.
48. Tschannen DJ. Organizational structure, process, and outcome: The effects of nurse staffing and nurse-physician collaboration on patient length of stay. Dissertation 2005;DAI-B 66/02, p. 821, Aug 2005:AAT 3163954.
49. Houser E. Nurse staffing levels and patient outcomes. Dissertation 2005;DAI-B 66/04, p. 1978, Oct 2005:AAT 3172609.
50. Estabrooks CA, Midodzi WK, Cummings GG, et al. The impact of hospital nursing characteristics on 30-day mortality. Nurs Res Mar-Apr 2005;54(2):74-84.
51. Halm M, Peterson M, Kandels M, et al. Hospital nurse staffing and patient mortality, emotional exhaustion, and job dissatisfaction. Clin Nurse Spec Sep-Oct 2005;19(5):241-51; quiz 52-4.
52. Wan TT, Shukla RK. Contextual and organizational correlates of the quality of hospital nursing care. QRB Qual Rev Bull Feb 1987;13(2):61-4.
53. Flood SD, Diers D. Nurse staffing, patient outcome and cost. Nurs Manage May 1988;19(5):34-5, 8-9, 42-3.
54. Shortell SM, Hughes EF. The effects of regulation, competition, and ownership on mortality rates among hospital inpatients. N Engl J Med Apr 28 1988;318(17):1100-7.
55. Thorson MJ. Hours of nursing care: Relationship to patient outcomes. Dissertation 1995;DAI-B 57/02, p. 992, Aug 1996:AAT 9616239.
56. ANA. Implementing Nursing's Report Card. A Study of RN Staffing, Length of Stay and Patient Outcomes. The American Nurses Association. 1997;American Nurses Publishing, Washington DC, 1997.:ISBN 1558101349.
57. Archibald LK, Manning ML, Bell LM, et al. Patient density, nurse-to-patient ratio and nosocomial infection risk in a pediatric cardiac intensive care unit. Pediatr Infect Dis J Nov 1997;16(11):1045-8.
58. Blegen MA, Vaughn T. A multisite study of nurse staffing and patient occurrences. Nurs Econ Jul-Aug 1998;16(4):196-203.
59. Blegen MA, Goode CJ, Reed L. Nurse staffing and patient outcomes. Nurs Res Jan-Feb 1998;47(1):43-50.
60. Bond CA, Raehl CL, Pitterle ME, et al. Health care professional staffing, hospital characteristics, and hospital mortality rates. Pharmacotherapy Feb 1999;19(2):130-8.
61. Pronovost PJ, Jenckes MW, Dorman T, et al. Organizational characteristics of intensive care units related to outcomes of abdominal aortic surgery. Jama Apr 14 1999;281(14):1310-7.
62. Robertson RH, Hassan M. Staffing intensity, skill mix and mortality outcomes: the case of chronic obstructive lung disease. Health Serv Manage Res Nov 1999;12(4):258-68.
63. Lichtig LK, Knauf RA, Milholland DK. Some impacts of nursing on acute care hospital outcomes. J Nurs Adm Feb 1999;29(2):25-33.
64. Amaravadi RK, Dimick JB, Pronovost PJ, et al. ICU nurse-to-patient ratio is associated with complications and resource use after esophagectomy. Intensive Care Med Dec 2000;26(12):1857-62.

65. ANA. Nurse Staffing and Patient Outcomes: In the Inpatient Hospital Setting. American Nurses Publishing, Washington DC, 1997 2000:1558101519.
66. Unruh LY. The impact of hospital nurse staffing on the quality of patient care. Dissertation 2000;DAI-A 61/04, p. 1543, Oct 2000:AAT 9969789.
67. Silber JH, Kennedy SK, Even-Shoshan O, et al. Anesthesiologist direction and patient outcomes. Anesthesiology Jul 2000;93(1):152-63.
68. Whitman GR, Davidson LJ, Sereika SM, et al. Staffing and pattern of mechanical restraint use across a multiple hospital system. Nurs Res Nov-Dec 2001;50(6):356-62.
69. Ritter-Teitel J. An exploratory study of a predictive model for nursing-sensitive patient outcomes derived from patient care unit structure and process variables. Dissertation 2001;DAI-B 62/02, p. 785, Aug 2001:AAT 3003686.
70. Dimick JB, Swoboda SM, Pronovost PJ, et al. Effect of nurse-to-patient ratio in the intensive care unit on pulmonary complications and resource use after hepatectomy. Am J Crit Care Nov 2001;10(6):376-82.
71. Sovie MD, Jawad AF. Hospital restructuring and its impact on outcomes: nursing staff regulations are premature. J Nurs Adm Dec 2001;31(12):588-600.
72. Pronovost PJ, Dang D, Dorman T, et al. Intensive care unit nurse staffing and the risk for complications after abdominal aortic surgery. Eff Clin Pract Sep-Oct 2001;4(5):199-206.
73. Blegen MA, Vaughn TE, Goode CJ. Nurse experience and education: effect on quality of care. J Nurs Adm Jan 2001;31(1):33-9.
74. Aiken LH, Clarke SP, Sloane DM, et al. Hospital nurse staffing and patient mortality, nurse burnout, and job dissatisfaction. Jama Oct 23-30 2002;288(16):1987-93.
75. Dang D, Johantgen ME, Pronovost PJ, et al. Postoperative complications: does intensive care unit staff nursing make a difference? Heart Lung May-Jun 2002;31(3):219-28.
76. Tourangeau AE, Giovannetti P, Tu JV, et al. Nursing-related determinants of 30-day mortality for hospitalized patients. Can J Nurs Res Mar 2002;33(4):71-88.
77. Barkell NP, Killinger KA, Schultz SD. The relationship between nurse staffing models and patient outcomes: a descriptive study. Outcomes Manag Jan-Mar 2002;6(1):27-33.
78. Stegenga J, Bell E, Matlow A. The role of nurse understaffing in nosocomial viral gastrointestinal infections on a general pediatrics ward. Infect Control Hosp Epidemiol Mar 2002;23(3):133-6.
79. Alonso-Echanove J, Edwards JR, Richards MJ, et al. Effect of nurse staffing and antimicrobial-impregnated central venous catheters on the risk for bloodstream infections in intensive care units. Infect Control Hosp Epidemiol Dec 2003;24(12):916-25.
80. Mark BA, Salyer J, Wan TT. Professional nursing practice: impact on organizational and patient outcomes. J Nurs Adm Apr 2003;33(4):224-34.
81. Unruh L. Licensed nurse staffing and adverse events in hospitals. Med Care Jan 2003;41(1):142-52.
82. Simmonds KA. Nursing workload and its relationship to vancomycin-resistant enterococci colonization in chronic dialysis patients. Dissertation 2004;MAI 43/02, p. 529, Apr 2005:AAT MQ93404.
83. Tallier PC. Nurse staffing ratios and patient outcomes. Dissertation 2003;DAI-B 64/05, p. 2133, Nov 2003:AAT 3091301.
84. Berney BL. Use, trends, and impacts of nurse overtime in New York hospitals, 1995--2000. Dissertation 2003;DAI-B 63/11, p. 5154, May 2003:AAT 3072377.
85. Zidek CK. Assessment of nursing care quality and the judgment of the professional nurse as reflected in nurse-determined patient acuity classification and staffing decisions. Dissertation 2003;DAI-B 64/02, p. 642, Aug 2003:AAT 3080441.
86. Hope J. Nosocomial infections and their relationship to nursing workload in an acute care hospital. Dissertation 2003;MAI 42/04, p. 1241, Aug 2004:AAT MQ86117.
87. Cimiotti JP. Nurse staffing and healthcare-associated infections in the neonatal ICU. Dissertation 2004;DAI-B 65/04, p. 1775, Oct 2004:AAT 3128935.
88. Person SD, Allison JJ, Kiefe CI, et al. Nurse staffing and mortality for Medicare patients with acute myocardial infarction. Med Care Jan 2004;42(1):4-12.
89. Mark BA, Harless DW, McCue M, et al. A longitudinal examination of hospital registered nurse staffing and quality of care. Health Serv Res Apr 2004;39(2):279-300.
90. Mark BA, Harless DW, McCue M. The impact of HMO penetration on the relationship between nurse staffing and quality. Health Econ Jul 2005;14(7):737-53.
91. Stratton KM. The relationship between pediatric nurse staffing and quality of care in the hospital setting. Dissertation 2005;DAI-B 66/11, p. 5906, May 2006:AAT 3196584.
92. Elting LS, Pettaway C, Bekele BN, et al. Correlation between annual volume of cystectomy, professional staffing, and outcomes: a statewide, population-based study. Cancer Sep 1 2005;104(5):975-84.
93. Seago JA, Williamson A, Atwood C. Longitudinal analyses of nurse staffing and patient outcomes: more about failure to rescue. J Nurs Adm Jan 2006;36(1):13-21.
94. Shortell SM, Zimmerman JE, Rousseau DM, et al. The performance of intensive care units: does good management make a difference? Med Care May 1994;32(5):508-25.

95. Donaldson NE DSB, Linda Burnes Bolton, Carolyn Aydin ,Steven Paul, Bruce A. Cooper, Kathleen Yule. Unit Level Nurse Workload Impacts on Patient Safety. the Agency for Healthcare Research and Quality Working Conditions Grant Initiative 2004;Grant R01 # HS11954.
96. Lankshear AJ, Sheldon TA, Maynard A. Nurse staffing and healthcare outcomes: a systematic review of the international research evidence. ANS Adv Nurs Sci Apr-Jun 2005;28(2):163-74.
97. Lang TA, Hodge M, Olson V, et al. Nurse-patient ratios: a systematic review on the effects of nurse staffing on patient, nurse employee, and hospital outcomes. J Nurs Adm Jul-Aug 2004;34(7-8):326-37.
98. Seago JA, Spetz J, Mitchell S. Nurse staffing and hospital ownership in California. J Nurs Adm May 2004;34(5):228-37.
99. Hodge MB, Romano PS, Harvey D, et al. Licensed caregiver characteristics and staffing in California acute care hospital units. J Nurs Adm Mar 2004;34(3):125-33.
100. McGillis Hall L, Doran D, Baker GR, et al. Nurse staffing models as predictors of patient outcomes. Med Care Sep 2003;41(9):1096-109.
101. McGillis Hall L, Doran D, Pink GH. Nurse staffing models, nursing hours, and patient safety outcomes. J Nurs Adm Jan 2004;34(1):41-5.
102. Skipper JK, Jr., Jung FD, Coffey LC. Nurses and shiftwork: effects on physical health and mental depression. J Adv Nurs Jul 1990;15(7):835-42.
103. Gold DR, Rogacz S, Bock N, et al. Rotating shift work, sleep, and accidents related to sleepiness in hospital nurses. Am J Public Health Jul 1992;82(7):1011-4.
104. Ruggiero JS. Correlates of fatigue in critical care nurses. Res Nurs Health Dec 2003;26(6):434-44.
105. Rogers AE, Hwang WT, Scott LD, et al. The working hours of hospital staff nurses and patient safety. Health Aff (Millwood) Jul-Aug 2004;23(4):202-12.
106. Trinkoff A, Geiger-Brown J, Brady B, et al. How long and how much are nurses now working? Am J Nurs Apr 2006;106(4):60-71, quiz 2.
107. Havlovic SJ, Lau DC, Pinfield LT. Repercussions of work schedule congruence among full-time, part-time, and contingent nurses. Health Care Manage Rev Fall 2002;27(4):30-41.
108. Hoffman AJ, Scott LD. Role stress and career satisfaction among registered nurses by work shift patterns. J Nurs Adm Jun 2003;33(6):337-42.
109. Hughes KK, Marcantonio RJ. Recruitment, retention, and compensation of agency and hospital nurses. J Nurs Adm Oct 1991;21(10):46-52.
110. Hughes KK, Marcantonio RJ. The clinical practice of supplemental nursing personnel. Nurs Adm Q Spring 1993;17(3):83-7.
111. Warren IB, Rozell BR. Supplemental staffing. Nurse manager views of costs, benefits, and quality of care. J Nurs Adm Jun 1995;25(6):51-7.
112. Strzalka A, Havens DS. Nursing care quality: comparison of unit-hired, hospital float pool, and agency nurses. J Nurs Care Qual Jul 1996;10(4):59-65.
113. Jolma DJ. Relationship between nursing work load and turnover. Nurs Econ Mar-Apr 1990;8(2):110-4.
114. Wetzel K, Soloshy DE, Gallagher DG. The work attitudes of full-time and part-time registered nurses. Health Care Manage Rev Summer 1990;15(3):79-85.
115. Porter RT, Porter MJ. Career development: our professional responsibility. J Prof Nurs Jul-Aug 1991;7(4):208-12.
116. Burke RJ, Greenglass ER. Effects of hospital restructuring on full time and part time nursing staff in Ontario. Int J Nurs Stud Apr 2000;37(2):163-71.
117. Crawford L. Nurses educated in other countries: coming to America. JONAS Healthc Law Ethics Regul Jul-Sep 2004;6(3):66-8.
118. Dicicco-Bloom B. The racial and gendered experiences of immigrant nurses from Kerala, India. J Transcult Nurs Jan 2004;15(1):26-33.
119. Flynn L, Aiken LH. Does international nurse recruitment influence practice values in U.S. hospitals? J Nurs Scholarsh 2002;34(1):67-73.
120. Pizer CM, Collard AF, James SM, et al. Nurses' job satisfaction: are there differences between foreign and U.S.-educated nurses? Image J Nurs Sch Winter 1992;24(4):301-6.
121. Xu Y, Kwak C. Characteristics of internationally educated nurses in the United States. Nurs Econ Sep-Oct 2005;23(5):233-8, 11.
122. Yi M, Jezewski MA. Korean nurses' adjustment to hospitals in the United States of America. J Adv Nurs Sep 2000;32(3):721-9.
123. Shader K, Broome ME, Broome CD, et al. Factors influencing satisfaction and anticipated turnover for nurses in an academic medical center. J Nurs Adm Apr 2001;31(4):210-6.
124. Berney B, Needleman J, Kovner C. Factors influencing the use of registered nurse overtime in hospitals, 1995-2000. J Nurs Scholarsh 2005;37(2):165-72.
125. O'Brien-Pallas L, Shamian J, Thomson D, et al. Work-related disability in Canadian nurses. J Nurs Scholarsh 2004;36(4):352-7.
126. Berney B, Needleman J. Trends in nurse overtime, 1995-2002. Policy Polit Nurs Pract Aug 2005;6(3):183-90.