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TECHNOLOGY AND THE COST OF HEALTH CARE

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REPORT

PREPARED BY THE

SUBCOMMITTEE ON
SCIENCE, RESEARCH AND TECHNOLOGY

OF THE

COMMITTEE ON
SCIENCE AND TECHNOLOGY

U.S. HOUSE OF REPRESENTATIVES

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LETTER OF TRANSMITTAL

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
Washington, D.C., October 20, 1979.

Hon. DON A. FUQUA,
Chairman, Committee on Science and Technology, U.S. House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: I submit herewith the report, Technology and the Cost of Health Care. It is based on information collected during the 95th Congress by the Subcommittee on Domestic and International Scientific Planning, Analysis, and Cooperation, chaired at that time by James H. Scheuer, of New York.

The report contains an analysis of hearings held in September and October of 1978, and of information gathered by site visits, informal interviews and study of the literature.

The report describes the connection between technology and other factors that contribute to the steeply rising cost of medical care. It notes that the health care system is primarily financed by health insurance, and identifies incentives now prevailing in reimbursement practices as the principal driving force behind the inflation of health care costs. Reimbursement policies, coupling with other incentives described in the report, provide relatively unbalanced encouragement for technologies that seek to do things better, regardless of the cost.

Although machines and their applications tend to become more complicated and expensive, they do not always bring the desired improvement in results. Or, more often, they appear to offer improvement, but the magnitude cannot be estimated because evaluation data are not systematically collected and applied.

The report recognizes the need for assessment and evaluation. It agrees with recent legislation that these should guide the selection of appropriate reimbursement policies for emerging or existing technologies. In addition, it recommends that the Department of HEW extend its technology evaluation and assessment to planning and to managing selective development and technology transfer.

I commend these findings to your attention and to the Members of the House.

Respectfully submitted,

GEORGE E. BROWN, JR.,
Chairman, Subcommittee on Science, Research and Technology.

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FINDINGS

1. Hospital care is the largest portion of all health care expenditures.

2. The increasing expenditure for hospital care is due to increasing per capita consumption. There are more hospitalizations per year per thousand population and the cost per hospitalization is greater. The rising cost of hospitalization reflects a greater intensity and a greater sophistication of services performed per average patient day.

3. An important contributor to rising costs is the increasing labor intensity of hospital care. In 25 years, the number of hospital employees per patient has nearly doubled.

4. In other industries, technology tends to replace labor, and to hold costs down even when quality is improved. In health care, and especially in hospitals, technology tends to *increase* the ratio of workers to patients. Medical technology is designed to do things better, but rarely to do them more cheaply.

5. The relationship between medical technology and the costs of health care is complicated by factors that encourage unrestrained demand. Because of insurance or subsidy, a patient's out-of-pocket cost for hospital care is small. Doctors also have many incentives for choosing a style of medicine that is expensive and that leans heavily on an advancing technology. Cost-effectiveness is not a major determinant in choosing or paying for medical care.

6. Hospital, doctor, and patient motives energize an endless, cost-raising cycle. Investment in hospitals and equipment must be financed by patient fees. Hospitals vie for prestigeous medical staff who can attract the patients and generate fees. The best staff want to associate with the best-equipped hospitals.

7. Positive incentives, not balanced by cost considerations, promote the use of heroic measures for prolonging life, even when effectiveness is questionable. At present, the demand for such measures is limited primarily by the supply.

8. Methods for determining medical safety and effectiveness need improvement. Safety and effectiveness criteria could, but do not, play a greater role in treatment decisions and in reimbursement policies.

9. Information technology, which could play a major role in determining medical safety and effectiveness, is poorly developed, is funded at a token level, and is not aggressively applied to that purpose.

10. The Department of Health, Education, and Welfare has had no functioning mechanism for the overall management of technology. There is no centralized strategic planning for the development, evaluation, application, reimbursement, or phase-out of medical technologies.

11. The overwhelming thrust of Federal health policy has been devoted to a search for cures and the treatment of disease. Much less effort has been devoted to disease prevention. Until recently, very little effective effort has been focused on health promotion.

12. Public Law 95–623 created a new National Center for Health Care Technology, (NCHCT), to coordinate health statistics activities, health services research, and the evaluation or assessment of medical technology. Some of these functions are necessary for deciding reimbursement policies and managing the development of technology undertaken or supported by HEW. They could be useful in planning overall Federal health strategies.

13. In Public Law 95–623, the language affecting medical technology emphasizes evaluation and assessment. Technology management or policy development is implied but is not explicit in the law.

14. The burden of technology evaluation and assessment can easily saturate the resources of the new Center (NCHCT). That likelihood is enhanced by the small amount of money appropriated for its first year of operation.

15. There are several outside resources in the health care community that might be tapped by DHEW for evaluating existing or emerging technologies. There is latent potential in the private sector for consensus-gathering standard-setting, and self-regulation. If this potential can be mobilized by DHEW, the feasibility of assigning other technology planning functions to NCHCT would be improved.

16. Computer applications in health care is one technology—and there are many others—that can reach its best potential for public good only if DHEW provides a technology management service that links research, development, and technology transfer with national priorities, and promotes coherence in the plans and programs of the Department.

17. The Committee finds, in summary, that a new management framework is available at DHEW, and some steps have been taken toward replacing piecemeal, ad hoc policies. If DHEW determines to do so, it is possible that this new framework can be developed to a fuller realization of sound management concepts.

RECOMMENDATIONS

1. Steps should be taken to modify the incentive balance in the Nation's health care system. Since there are numerous cost-inducing incentives, operating in such diverse areas as medical education and medical reimbursement practices, a broad selection of reforms is needed. Some reforms are needed to move the health care system closer to being a more normal "market". Other, more indirect influences on the incentive and reimbursement system would affect how values of medical technology are perceived and implemented.

Ethical and value problems arise in the termination of care of the dying. DHEW should enccurage rational and humane consideration of these problems, as well as psychic and emotional support for the dying, when dying is inevitable.

2. DHEW should modify the reimbursement practices in Federally subsidized health insurance to include medical effectiveness as a more critical element. Efforts should be undertaken to encourage private insurers also to do this.

3. DHEW should promote the gathering, analysis, and dissemination of information on cost and medical effectiveness of health care procedures, practices, and technologies. Contributions should be planned by the National Center for Health Statistics and the National Center for Health Services Research. Over the long term, computer systems and technology for health care should be developed to play a role, at the hospital level, in a larger system for evaluating medical effectiveness of health care practices.

4. The Federal Government, at the level of the Executive Office of the President, should consider the relative costs and merits of alternative health policies and priorities. In particular, the relative emphasis on disease prevention, as opposed to "cures" and treatments, should be periodically assessed.

5. The Secretary of HEW should give the National Center for Health Care Technology, and its advisory Council, instructions defining a broad role in the development of a rationale and strategies for managing the selective development, transfer, and promotion of health care technologies and practices.

6. The Committee suggests that computer technology for applications in health services deserves special attention as a model problem on which to plan and implement a federal technology management program. The different possible directions in which this technology may develop vary considerably in possible public benefit and in need for public support. The development of a rational and coherent plan for maximizing these benefits and fitting these needs would be a desirable exercise for DHEW and, especially, the National Center for Health Care Technology.

7. The National Center for Health Care Technology should resist saturation of its slender resources by enlisting the aid and cooperation of the private sector in evaluating and assessing health technologies, procedures, and practices. The Medical Necessity Program, originated by the Blue Shield Association and carried out in cooperation with several organizations, illustrates the private sector potential.

INTRODUCTION

In recent years, an extraordinary rise in the cost of health care has caused a great deal of concern, stimulated a considerable amount of study, and is generating increasingly urgent problems. Hospitalization costs having risen at twice the inflation rate, set the pace for overall health care expenditures that are approaching 10 percent of the gross national product. These expenditures threaten to deplete the Social Security trust fund and are causing employment fringe benefits to compete vigorously with potential wage increases. Through one or more mechanisms involving taxation, wages, or direct insurance payments, health care expenses are consuming a rapidly increasing share of the income of all Americans.

Hospitals account for by far the largest portion of all health services. Consequently, hospital charges dominate the national health bill. Because the steep rise in the cost of hospitalization has been associated with dramatic changes in the intensity and sophistication of care, attention has been drawn to the costly technology on which modern medicine is based. Is a rapidly evolving and ever more sophisticated technology responsible for rising health costs? Are the returns reasonable for the expense? Could we be doing any better? What steps, if any, involving the development and use of technology, could be taken at the Federal level to lessen its inflationary effect, promote desirable choices, and gain some control of the future? These and related questions induced the Committee on Science and Technology to undertake studies of how technology is developed and used in the delivery of health services, how it relates to cost and quality of medical care, and how public policies affecting those relationships might be initiated or improved.

The subject of the present report was examined in hearings on Technology and the Cost of Health Care, September 26 and 27, and October 6, 1978. They were preceded by hearings on Computers in Health Care.[1]

Costs and Cost Determinants in the Health Care System

Between 1950 and 1976, total annual expenditures for medical care in the United States rose from about $12 billion to about $139 billion. Per capita expenditures went from $78 to $637, and average daily hospital charges ("average cost per patient day") rose from about $15 to $175. Such increases are the result of many components, including the general rise of other prices in the economy.

While impressive, and often quoted, the raw figures require some analysis before their meaning is clear. Since some of the growth in total expenditure is due to population growth alone, per capita ex-

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[1] "Computers in Health Care." Hearings before the Subcommittee on Domestic and International Scientific Planning, Analysis, and Cooperation. Ninety-fifth Congress, Second Session, May 9, 10, and 11, 1978. See also Report of the Subcommittee, same subject.

penditure is a more meaningful measure. However, that measure has several components.

Part of the rise in per capita health care expenditure [2] comes from a 35 percent increase in hospital patient days per year per 1,000 population. This trend was paralleled by an even larger (300%) increase in outpatient visits per 1,000. Furthermore, in addition to more hospital visits, other evidence indicates that patients received increasingly more services, and more expensive services, per visit.

The average total charge for a day in a hospital is a measure of the services purchased by patients. On the average, charges for a day in a hospital far out-stripped the general inflation rate and the special wage and price inflation that was unique to hospitals. From 1959 to 1975, the average cost per patient day (ACPPD), corrected to constant (1967) dollars, rose from $21.66 to $94 and is still going up. According to Dr. Marc Roberts, one of the witnesses testifying at the hearing, almost ¾ of the increase above general inflation is accounted for by the increased use of inputs (plant, equipment, personnel) used to produce each patient day. One component of that, labor, has risen from 2 to 3.4 hospital employees per patient. In addition, more facilities and equipment are now provided and each tends to grow more elegant, sophisticated, and expensive.

Witnesses generally agreed that increased use of inputs, or intensity and quality of service, reflects a widespread use of new technology. Dr. Andrew Miller, in his statement to the Subcommittee, cited a recent estimate [3] that the application of new technology accounts for an additional 5 or 10 percent of costs above the national rate of inflation. Changes in the nature of health care have been strongly influenced by what is perceived as an "explosion of high technology medicine," [4] and this perception has stimulated many studies, forums, and analyses.[5]

Probably the most popularly known example of the proliferation of high technology instruments is the CT scanner (or "CAT" scanner).[6] A study by the Center for the Analysis of Health Practices at the Harvard School of Public Health surveyed recent growth in the distribution of these machines. They found that in a 6-month sample period in 1977, the number of scanners in place or on order by hospitals and private physician's offices rose from 829 to 1,035. The CT scanner, however, is only one example of the rapid influx of new devices and procedures into medical practice. Many other devices, both large and small, are participating in a continual rapid upgrading of the technological base that has become characteristic of medical practice and, especially, of diagnostic procedures. Both the number of tests and the number of types of tests available in clinical practice are currently growing at an estimated rate of 10–15 percent per year.

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[2] Per capita health care expenditure—total annual health care expenditure averaged over the population.

[3] Richard H. Egdahl, "The New England Journal of Medicine," August 31, 1978.

[4] Focus, Harvard University News Office for the Medical Area, Boston, February 8, 1979. "Studies at HSPH Center Examine Impact of Technology on Medicine," pp. 4–5.

[5] "Medical Technology and the Health Care System" ; A Report by the Committee on Technology and Health Care, Assembly of Engineering, National Research Council, and Institute of Medicine. National Academy of Sciences. Washington, D.C. 1978.

"Medical Technology and Hospital Costs: Notes for Policy," Judith L. Wagner and Michael Zubkoff in "Hospital Cost Containment: Selected notes for Future Policy," Milbank Memorial Fund and National Center for Health Services Research.

"Medical Technologies—the Culprit Behind Health Care Cost?" Summer Symposium of the Sun Valley Forum, Inc. August 1–5, 1977.

[6] CAT—Computed Axial Tomography.

What are the factors behind such changes? Why are all these changes occurring now and in the recent past? What economic factors support such rapid growth? Plausible answers to these questions are found in a generally accepted description of the health care system that explains why the system behaves as it does, and how technology has become associated with rapidly rising costs. The description presented or implied by the hearing testimony and widely found in the literature [7] stresses the interaction of a number of coincident social, technological, and economic elements, forces and events. Despite the complexity deriving from numerous contributing factors, the essence of the description is very simple. In addition, the consistency with which minor or new elements can be embraced in the main descriptive pattern lends an extra degree of plausibility.

The gist of the rationale is that cost-plus reimbursement for health services, paid for by private health insurance, Medicare or Medicaid, provides little or no incentive to doctors, patients, or hospital administrators to hold costs down. Driven by a variety of incentives, and lacking the cost constraints that would prevail without insurance, they choose a style of medicine that is both intensive and expensive. It leans heavily on a freely advancing technology. And because there is little incentive to save money, this technology tends to increase, rather than replace, the amount of labor needed to care for patients. Technological advance supports specialization and a resulting increase in the number of skilled persons needed in the diagnosis and treatment of patients. The increasing demand for skilled labor and the competition among hospitals and clinics for new skill categories is readily financed by characteristically elastic and permissive reimbursement policies. By and large, and until very recently, the "third parties"—insurance companies, administering either private or public insurance (e.g., Medicare) funds—have left it to the doctors to make nearly all the decisions. If insurance is paying for it, there is little perceived reason to save money. Instead, medical idealism, professional rewards, and a relatively open-ended demand are the principal motivations available.

Many factors participated in determining the present character and high cost of health care. Some had their roots in technical and social changes occurring in the past 30 years. Early in that period, the development and application of antibiotics was a particularly important event. Later, social reforms like Medicare and Medicaid, Government aid for health facilities, and a subsidized revolution in medical education spurred changes that are still reverberating. It is helpful to examine in some detail how these events contributed and interacted.

Exploitation of antibiotics as antibacterial drugs, and the concurrent broadening and improvement of immunization to control viral diseases, sharply diminished the occurrence or severity of infectious diseases. A shift in the disease pattern occurred in which cancer, birth defects, cardiovascular problems, aging and degenerative problems be-

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[7] See for instance—Victor Fuchs, ed. "Essays in the Economics of Health and Medical Care" (National Bureau of Economic Research, New York, 1972). Vincent Navarro, "National Health Insurance, the Strategy for Change." (Milbank Memorial Fund Quarterly 51 No. 2, Spring 1973). Health Care Expenditures and Their Control—a report by the Health Staff, Education and Public Welfare Division, Congressional Research Service, Library of Congress, May 25, 1977, Martin Feldstein, "The High Cost of Hospitals—and What To Do About It." (The Public Interest, No. 23, Spring 1917).

came the dominant threats to health. Reduction of infectious disease and an increasing ability to prolong life made old age more generally attainable.

Even without the bias of increased age, noninfectious diseases tend to be expensive to deal with, being either persistent and requiring longer treatment, or requiring expensive technological aids. For the aged, illness is more frequent, and the greater risk of death in this fragile population encourages or necessitates more vigorous, and sometimes heroic, countermeasures. Thus, age shift and disease shift by themselves should have caused a rise in expenditures for medical care and would have influenced the frequency of hospital visits and the average daily rates charged to hospital patients even if other factors—like health insurance—had not also entered the scene.

Over the past 30 years there has been a continuing growth in hospitalization insurance. Special tax incentives favor the inclusion of company-paid insurance packages in the fringe benefits for employees. Passage of the Medicare and Medicaid bills in 1965 added to this trend by providing hospital insurance for the aged through Social Security, subsidizing optional insurance for doctor bills, and making federal grants to the States for the medically needy. In addition to the large scale growth in medical insurance, there have been government programs to subsidize hospital expansion, upgrade equipment and train more doctors. The combined affect of all this has been to increase the supply and quality of medical care and to make high quality care available to many more people. By stimulating both demand and supply, the measures have enhanced both unit costs and total expenditures.

The average portion of hospital cost paid directly by the patient has steadily dropped from about 50 percent in 1950 to about 12 percent in 1975. As a result, while the average charge per patient day rose from $15.62 in 1950 to $151.53 in 1975, the personal out-of-pocket cost to the patient changed only from $7.75 per day to $18.03 per day. When translated into constant dollars, this personal or out-of-pocket cost per average patient day has shown virtually no change at all throughout this whole period. Hence, there has been, if anything, a decrease in the perceived burden of immediate cost to the patient, despite the huge increase in actual cost. The real burden has been smoothed by spreading the cost of illness over a large insurance base, and by imbedding much of the cost in Social Security taxes and in fringe benefits paid directly by employers.

The purpose of Medicare, Medicaid, and the government programs that facilitated hospital expansion and improvement of capital equipment, was to increase the consumption and quality of hospital services. In most respects, they were very successful [8], bringing millions more people under an umbrella of assurance and protection, placing high quality medical care, including the best available treatment for catastrophic illness, within the reach of virtually all who need it. But implementing these programs through a system of "third party" payers that left all the decisions in the hands of the medical establishment provided both suppliers and consumers with unbalanced

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[8] Alain Enthoven and Roger Noll, "Regulatory and Non-Regulatory Strategies for Controlling Health Care Costs." Prepared for the Sun Valley Forum, Conference on "Technology—the Culprit Behind Health Care Costs?" Sun Valley, Idaho, July 31–August 5, 1977.

incentives. When natural constraints were removed from the demand, the supply system reacted to steadily increase and upgrade the quality, elaborateness and sophistication of care and progressively adopted a more intensive and costly character.

It has been observed [9] that in this period of social evolution and reform, hospitals began to behave differently. They greatly enlarged their capacity, dramatically upgraded services, and rapidly closed the wage gap that once plagued hospital workers. In the same period, and aided by Government programs that built and subsidized research facilities, medical training was undergoing changes that would greatly affect the style and cost of care to be delivered. A trend toward specialization was marked by a trend toward greater sophistication, first in the teaching hospitals and, eventually, in the community hospitals. More emphasis on research and technology and an upgrading of the M.D. degree to the equivalent of a Ph. D. brought a broadening ability to employ expensive technologies that created a new prestige standard for practitioners.

It became a mark of community and professional pride to offer the latest and best of techniques and facilities. Through a set of mutually reinforcing relationships, it is now close to an economic necessity. Both Dr. Roberts and Dr. Cohen pointed out that hospitals have normal business incentives to compete for "customers". The necessity to pay off capital debts and other fixed costs requires a steady flow of patient fees. Impressive facilities attract a respected staff which, in turn, attracts patients, keeps the beds filled and revenues high. Although it promotes more costly options in the delivery of medical care, there is no lack of demand. In fact, under the present system, consumption must be limited chiefly by supply. Thus, current policies to control costs place much importance on controlling the number of physicians, beds, intensive care units, CAT scanners, etc.

The Role of Capital Equipment and Technology in Cost Enhancement

In the post WWII period, Government grants for construction and modernization, and an investment climate that facilitated hospital financing, stimulated the growth of bed capacity from a national average of 3.48 per thousand of population in 1955 to 4.48 in 1975. In some areas, the bed-to-population ratio went considerable higher, to 5.4–66.7 in west north central states, and a record 7.7 in New York. It is estimated that an unoccupied bed costs 50–60 percent of what it would cost to maintain a patient in it, in the range of $18,000–$27,000 per year. So long as it can be kept filled, this cost will be recovered in charges for the patient. But, for occupancy rates less than 100 percent, maintenance costs for unoccupied beds must be distributed over the paying clients, thereby increasing the average cost per patient day (ACPPD).

The national average occupancy rate of 75 percent (for 1975) is below the 80 percent standard proposed in the Hospital Cost Containment Bill. H.R. 6575, that was considered and rejected by Con-

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[9] Robert J. Blendon and Thomas W. Moloney, "Perspectives on the Growing Debate Over the Cost of Medical Technologies." Sun Valley Forum, Conference on "Technology—The Culprit Behind Health Care Costs?" Sun Valley Idaho, July 31–August 5, 1977.

gress in 1978, and may be contrasted to the 90 percent consistently achieved by some hospitals with computerized scheduling. For 75 percent occupancy, the cost of unused beds, if distributed among the actual patients, adds about 33 percent to that portion of their charges that pays for the mere existence of the bed, and 17–20 percent to the whole daily charge [10]. Other factors, however, have had even greater impact on the ACPPD.

Analysis of the rise in ACPPD indicates both an increase in the number or amount of goods and services provided per patient day and an increase in cost of these inputs over and above the general inflation rate, with the first of these accounting for most of the change. Hospitals have added employees, raised wages to catch up with other industries, and adopted voluminous use of expensive equipment and materials.

Examining these changes leads inevitably to technology as a major contributor to the increase of both volume and unit cost of services. Large and expensive facilities must be financed either by additional income they will generate or by a general increase in other hospital charges. Some, like the CAT scanner, are economically attractive to hospitals because, due to predictable or controllable patient volume, it appears they can generate more than enough revenues to offset their high cost. Others, like some intensive care facilities and their special attached services, have much of their cost distributed among non-users. Nearly all of them entail significant maintenance and operating costs, over and above purchase, and this generally results from the additional technicians and medical specialists associated with them.

Attention is often called to "big-ticket" devices like the CAT scanners, the hyperbaric (high-atmospheric-pressure) chambers, and the cyclotrons, betatrons and cobalt machines used in radiation therapy. But it would be a serious error to overlook the impressive costs added by much smaller and less publicized additions to the medical arsenal.

Throughout any hospital, one will find many relatively small and not very expensive devices whose impact on patient costs derives from the added cost of associated, specially trained, personnel. Biomedical engineers, hyperalimentation nurses, respiration therapists, and radioimmunoassay technicians are examples of the additional staffing required by "small" technology and the technological intensification and upgrading of hospital services. These and other paramedical technicians are needed to handle competently the growing variety of relatively small devices related to their specialty, and to provide for the increasing demand created by a growing appreciation for their special skills. At the Massachusetts General Hospital, where the innovation pace may be expected to be high, a staff of four respiration therapists, with a budget of $32,333 in 1959 grew to 70, with a budget of $884,000 in 1976. A glance at the job advertisements in any large newspaper will reflect the demand by even small community hospitals for qualified respiration technicians.

As a result of the emphasis on science in a modern medical education and the intimate association of technology with medical specialization,

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[10] Let D=daily charge rate (per bed, 100% occupied). Assume charges=costs (no profit). Cost per day empty bed=0.5D. Call this "bed maintenance". When there are N beds, 75 percent occupied, the cost of 0.25 N unoccupied beds is distributed over 0.75 N patients.

Bed maintenance charge per patient per day $=0.5D+\frac{0.25N}{0.75N}(.5D)=0.5D+\frac{1}{3}(0.5D)$

Total chrges per patient per day $=2(0.5D)+\frac{1}{3}(0.5D)=1\frac{1}{3}D$.

a doctor's standing among his peers is heavily dependent upon his ability to marshall the latest and the best of technology in the treatment of patients. Doctors make the decisions on what is necessary, desirable or appropriate. If marginal improvement to accuracy of diagnosis or to completeness of health status evaluation might be gained from additional tests, there is little perceived reason to withhold them. As death approaches, heroic measures may be regarded as necessary even if they are probably insufficient. And the ever-present threat of a malpractice judgment is significant evidence that society tends strongly to uphold this attitude.

The natural evolution of medical practice, drawing on rapid advancements of technology, and financially aided by government through biomedical research, education, and subsidy of hospital facilities, has transformed many diagnostic and treatment standards and options.

Unlike surgery and certain other forms of treatment, diagnostic procedures tend not to be exclusive, but can be paralleled or compounded and this is nowhere more evident than in clinical laboratory tests. Automation has dramatically reduced the cost per test, but the number of tests requested has grown at an even greater rate. From 1971 to 1975 test expenditures grew from $5.6 billion to about $12 billion, despite decreases in unit cost. This multiplication of tests is only one manifestation of a cautious and quality-conscious attitude that generally favors back-up modalities of instrumentation and procedures for checking marginal possibilities.[11] Critics suggest that much of the multiple testing is wasteful and unnecessary.[12] But without good data on the numerous specific issues involved, there is no way to reach satisfactory conclusions.

Information Needs for Decisions in Care and in Public Policy

Certain areas of diagnostic medicine have particularly sensitive needs for good data on efficacy or cost effectiveness. Radiology is one. Here, rapid technological evolution produces a profusion of related but not equivalent devices, rapid obsolescence of expensive machines, and a need for comparative data for optimizing their use or managing their purchase or retirement. Probably no device or procedure has received more critical publicity than that for Computerized Axial Tomography, known as the "CAT" or CT scanner.[13] For visualizing certain organ problems, it is unequaled by any other method in speed, safety, and definition, but its use has been extended to other applications in which it has questionable merit and occasionally is believed to be unnecessarily expensive or inferior to alternative procedures. Some misuse might be due to fiscal realities requiring steady and substantial revenues to finance such an expensive facility. Certainly, observers are questioning whether there are enough "legitimate" needs to justify the number of machines now installed or on order. The data needed to confirm such an assessment are inadequate and will, at best, be developed and disseminated very slowly. Meanwhile, all existing machines will generate enough reimbursement income to finance their purchase and upkeep.

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[11] E.g., exploring for bowel or prostrate malignancy in a patient with hemorrhoids.
[12] Anon. "Medical Technology: Too Much of a Good Thing?" Forbes, June 1, 1977.
[13] Preferred terminology is CT Scanner (American College of Radiology).

With a battery of ultrasonic, x–ray, and particle-accelerating devices for exploration and image formation, and an additional battery of auxiliary techniques of catheterization and infusion for enhancing the resultant images, it takes remarkable expertise to select and choose among the alternatives. Naturally, among experts, much is known about the relative merits, but there are significant areas of insufficient comparative knowledge, and these are prone to personal loyalties to particular procedures, and to economic motivations to keep certain machines or crews employed. Some procedures, like cardiac catheterization, are so delicate and demanding that they should be reserved only for places where the patient volume guarantees frequent exercise of the team skills required. Altogether, there are many factors contributing sometimes to sub-optimum choices, sometimes to wasteful and unnecessary duplication or substitution. These events spoil the overall cost-effectiveness of technologies that are not inherently poor or wasteful, but merely wastefully employed.

The issues of potential waste, medical effectiveness, and cost-efficiency are especially prominent in certain areas of surgery and the treatment of catastrophic disease. They are raised partly by concern over its relative medical value and the occasional strain on available medical resources, and partly by the growing recognition that society probably cannot, or will not, generate or allocate the resources to react as fully as possible to every legitimate need for major surgery, end stage heroics, or chronic care.

In cardiac surgery, for example, technological advancement has radically altered the ability to deal successfully with previously intractable problems. Coronary artery by-pass grafting can remove the symptoms of angina and the immediate threat of possible fatal heart attack due to coronary artery obstruction. This, and various forms of heart defects requiring open heart surgery, have been made possible by sophisticated instrumentation during and immediately following surgery. But the great cost of these procedures, on the order of $10,000 or more per operation, is imposing a rapidly increasing burden on resources. It is estimated that up to 4 million persons are presently potential candidates for coronary by-pass surgery.[14] The use of this procedure is constrained, for the present, partly by professional caution and partly by the available facilities and the number of physicians trained in the operation. But both the facilities and the skills are spreading within the industry. At what level will it plateau? Can the necessary high level of skill be insured? Who should perform, and who should receive, this operation? How lasting are the life-quality improvements, and to what degree is the operation life-extending? What are the best criteria for patient selection?

These are difficult questions, but not painful as long as economic constraints are not severe. But coronary by-pass surgery is only one example for which these questions are important. As other expensive medical procedures are considered, economic limitations will cast the selection questions into a more uncomfortable realm of value judgement. There are many other forms of complex heart surgery yet to be introduced. Consider the prospects of heart assist devices, or a com-

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[14] McClure, Chapter 8, The Medical Care System Under National Health Insurance, in "Toward a National Health Policy" (Friedman and Rakoff, eds.) Lexington Books (1977).

plete, implantable, atomic-powered artificial heart. Analogous prospects will arise in other medical fields as well. Prospects based realistically upon current trends and on recent experience with kidney dialysis or the management of multiple organ birth defects in infants should lead us to expect that cost considerations will eventually become dominant. Somehow we will have to decide what fraction of the national income will be devoted to health care, what portion of our technical capability we will choose to exercise for that purpose, and how we shall apportion this among those who need it. Since the present system for providing medical services is relatively unfettered by these discriminating concerns or unresponsive to most of their implications, changes are likely to be forced onto the system. Limiting and discriminating considerations are inherent and may become formalized and regulated.

The recognition, selection, and implemention of choices in the provision of health care requires a volume and a quality of information for which there is already an overwhelming need. Even without the imposition of changes in the structure of the delivery system, the setting of medical standards, the development and use of facilities and techniques, and the management of individual patient treatment is dependent on, and can be considerably modified by, appropriate information. It is felt by many doctors that vigorous collection, critical assessment, and improved dissemination of information on who is doing what to whom, and what the outcomes are, would provide a sound basis for substantially improving both the quality and the cost-efficiency of health care. In addition, competent technology assessment for innovations on the horizon, and early evaluation of emergent techniques, before they can develop a constitutency, would contribute to intelligent planning by the profession, the suppliers, and the public policy makers. Good statistics, evaluation, and prognosticiation may well be the best start we can make toward controlling cost. Better information would help to temper the expectations of patients and their families, could encourage doctors and hospitals to avoid marginal procedures in the setting of medical standards, and would contribute to a more refined and less speculative analysis of what is wrong with our system. If policy alternatives such as national health insurance or some integrated national health plan are adopted, there will be an urgent and continuing need for information and methodologies for judging how well the system is working. Thus, it appears that, at all levels, from patient to institution, and in any system, either present or future, improvements in the gathering and employment of information would directly promote cost efficiency and certainly would illuminate the tasks of policy-making.

Technology Evaluation and Management in the Department of Health, Education, and Welfare

A rising consciousness of the problems associated with health technology prompted DHEW to undertake a brief study, in 1977, of opportunities for improving the Department's management of health technology affairs. Citing an "increasing advocacy for managing health technology toward serving the public more efficiently and effectively . . .", the study team sought to determine whether

emerging or existing technologies were systematically evaluated, and whether results of such evaluations were linked to specific action by DHEW. The report of the study [15] proposed a major management initiative toward linking the strategies, policies, and programs of all divisions of HEW to assure that medical technologies "are more carefully scrutinized for their efficacy and effect on health outcomes, more rapidly introduced or phased out of practice, more efficiently organized and equitably distributed, and more appropriately and effectively used". As a result of further study and planning, the Secretary approved the creation, in July 1978, of an Office of Health Technology, to link systematically the life cycle stages of development, evaluation, transfer, diffusion, utilization, and phase-out.[16]

During this period, related bills were in progress in both the House and Senate, culminating, in November 1978, in Public Law 95–623, The Health Services Research, Health Statistics, and Health Care Technology Act of 1978. This law specifies creation of a National Center for Health Care Technology, essentially the same thing as the administratively created Office of Health Technology. It provides that the Secretary "shall coordinate all health services research, evaluations, and demonstrations, all health statistics and epidemological activities, and all research, evaluations, and demonstrations respecting assessment of health care technology undertaken or supported" by DHEW. The National Center for Health Care Technology (NCHCT) is required to undertake assessments of health care technology, considering safety, effectiveness, cost effectiveness, and social, economic and ethical impacts, and to make recommendations to the Secretary respecting health care technology issues, including recommendations with respect to reimbursement policy.

In execution, the requirements of the new law are being incorporated in a reorganization of the Public Health Service, grouping the three National Centers—for Health Care Technology, Health Services Research, and Health Statistics—into a single organization within the Office of the Assistant Secretary of Health, to strengthen the development of health policy and the management of HEW programs related to health technology.

During the technology hearing before this Subcommittee, Dr. Richmond Testified that the (then) Office of Health Technology (OHT) would soon select 4 to 7 technologies for comprehensive assessment, taking into consideration the special need of the Health Care Financing Administration for information to guide its reimbursement policies. Dr. Rchmond indicated that OHT would receive input from NIH and the professional community [17] regarding priorities, efficacy, and safety and would receive assistance in the assessment from the Food and Drug Administration, the National Center for Health Services Research, The National Center for Health Statistics, The Health Resources Administration, and The Center for Disease Control.

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[15] "Health Technology Management at the Department of Health, Education, and Welfare." Final Phase I Report for the Secretary, prepared by Office of the Assistant Secretary of Planning and Evaluation and the Office of the Assistant Secretary for Health, December 22, 1977.

[16] Julius B. Richmond, Assistant Secretary for Health, in testimony before the Senate Subcommittee on Health and Scientific Research, Committee on Human Resources, February 7, 1978.

[17] The Office of the Director of the National Institutes of Health initiated a program under Dr. Seymour Perry (later to be appointed Director of the Office of Health Technology) to establish consensus-building mechanisms for the purpose of collecting, assessing and disseminating knowledge on safety, efficacy and other values of technology-based medical procedures.

All of these developments appear to represent improvements toward a less fragmented, more "systems approach" to the management of health technology affairs at DHEW. How far these will be carried, or whether they will be primarily limited to technology assessment, is a source of several specific concerns. At the present time, it is not clear that the term "health technology" is to be taken literally and not narrowed exclusively to "medical technology". It is also not clear that technology management in all its logical aspects will not be pushed aside by a nearly exclusive preoccupation with technology assessment.

The demands of technology assessment could easily overwhelm the effort. At costs estimated to reach several hundred thousand dollars per assessment, it is clear that a few assessments could saturate the resources of any one office or agency in DHEW. Yet the need is much greater than that. There are already dozens of procedures and techniques now in practice, including application of existing equipment, whose value is in question and that are legitimate candidates for assessment. Thus, the burdens of evaluation and assessment not only imply that other functions of NCHCT might perforce be slighted, but strongly suggest that a wide scale of outside resources must be tied into the program of the NCHCT.

In addition to the sister agencies of DHEW, there is a greater resource potential in the outside medical community that it may be possible to enlist. The Medical Necessity Program originated by the Blue Shield Association is an example of the amount and quality of expertise potentially available. Three major specialty societies—the American College of Physicians, the American College of Radiology, and the American College of Surgeons—with the assistance of the American Academy of Family Practice, the American Association of Medical Colleges, the American Hospital Association, the Blue Cross Association, and the Council of Medical Societies, undertook to evaluate the cost effectiveness of various medical procedures. Since 1977, this coalition has reviewed many procedures and assigned 42 of them to a class requiring special justification for reimbursement by Blue Shield.

The Health Care Financing Administration (HFCA), which would be the major "client" for evaluations to be performed by the National Center for Health Care Technology (NCHCT), has interests in common with Blue Cross and Blue Shield. In fact, Blue Cross and Blue Shield administer for HFCA on a contract basis a substantial portion of the claims deriving from parts A and B of Medicare, and in many states are the principal agents for Medicaid claim processing. It may be hoped, therefore, that the Medical Necessity Program might be enlarged, linked to the evaluation activities of NCHCT and its DHEW cohorts, and the results more widely shared. In any case, however, the Medical Necessity Program serves as a reminder of an as yet barely tapped potential, the capabilities latent in the private sector for consensus-gathering, standard setting, and self-regulation. If the new NCHCT can recruit and mobilize this potential, its ability to assume other management functions will be vastly improved.

The needs or opportunities identified by the DHEW management study team in 1977 and cited by Dr. Richmond in testimony before the Senate Subcommittee on Health and Scientific Research are still im-

portant. There is still a need to provide coordination and linkages among many technology-based activities. In many instances, what appear to be piecemeal, ad hoc programs within individual mission agencies, could benefit from an agency-wide, system-wide, or nation-wide view—a focal point for policy formation, long-range program planning, and program continuity and coordination. From this viewpoint, the relationship between epidemiology, preventive medicine, and acute care could be recognized and balanced in the planning process, and the interdependency of medical technology with other health technologies could find expression.

Computer applications in health research and health care illustrate very well the kind of benefit to be gained from a more holistic approach to research and development at DHEW. Perhaps more than other health technologies, computer technology can benefit from a management service that identifies the public interest, chooses an appropriate role and goals for Government activity, and integrates these into coherent plans and actions among its many agencies and programs. Such a management service might begin with a preliminary assessment, but would continue smoothly into the subsequent stages of planning and oversight. In doing so, it would recognize the important policy connections between selected applications of computer technology and new capacities for improving health statistics, epidemiology, and the environmental health studies mandated by the recent public health legislation. It would envolve a strategy that could assist agency planning and managing computer development activity over an extended period, in a kind of "cradle-to-grave" oversight, providing interagency collaboration and hand-over when appropriate, and insuring attention to the usually neglected phases of technology transfer and dissemination.

The management of computer technology would differ in some specifics from other technologies. The principles illustrated. however, are consistent with management concepts put forward by DHEW in early descriptions of the Office of Health Technology. The consistency recognizes that, whatever the technology, national goals are more likely to be met if they are defined, if they are systematically pursued, and if related efforts are coordinated. It is the Committeee's hope that, with the new management framework now available at DHEW, piecemeal, ad hoc R&D programming, lacking the continuity, purpose, or coordination afforded by an agency-wide, system-wide, or nation-wide view, will be replaced with a better method of seeking the overall good.

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