Creating a Culture of Innovation in Healthcare Settings: A Systematic Review

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PREFACE

The VA Evidence Synthesis Program (ESP) was established in 2007 to provide timely and accurate syntheses of targeted healthcare topics of importance to clinicians, managers, and policymakers as they work to improve the health and healthcare of Veterans. These reports help:

- Develop clinical policies informed by evidence;
- Implement effective services to improve patient outcomes and to support VA clinical practice guidelines and performance measures; and
- Set the direction for future research to address gaps in clinical knowledge.

The program comprises 3 ESP Centers across the US and a Coordinating Center located in Portland, Oregon. Center Directors are VA clinicians and recognized leaders in the field of evidence synthesis with close ties to the AHRQ Evidence-based Practice Center Program and Cochrane Collaboration. The Coordinating Center was created to manage program operations, ensure methodological consistency and quality of products, and interface with stakeholders. To ensure responsiveness to the needs of decision-makers, the program is governed by a Steering Committee composed of health system leadership and researchers. The program solicits nominations for review topics several times a year via the program website.

Comments on this evidence report are welcome and can be sent to Nicole Floyd, Deputy Director, ESP Coordinating Center at Nicole.Floyd@va.gov.

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This report is based on research conducted by the Evidence Synthesis Program (ESP) Center located at the **West Los Angeles VA Medical Center, Los Angeles, CA**, funded by the Department of Veterans Affairs, Veterans Health Administration, Health Services Research and Development. The findings and conclusions in this document are those of the author(s) who are responsible for its contents; the findings and conclusions do not necessarily represent the views of the Department of Veterans Affairs or the United States government. Therefore, no statement in this article should be construed as an official position of the Department of Veterans Affairs. No investigators have any affiliations or financial involvement (*eg*, employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties) that conflict with material presented in the report.

ACKNOWLEDGMENTS

This topic was developed in response to a nomination by Allison Amrhein, MPH, director of operations for VHA Innovators Network, and Brynn Cole, director of programming for VHA Innovators Network for the purpose of understanding how to create a culture of innovation in healthcare settings. The scope was further developed with input from the topic nominators (*ie*, Operational Partners), the ESP Coordinating Center, the review team, and the technical expert panel (TEP).

In designing the study questions and methodology at the outset of this report, the ESP consulted several technical and content experts. Broad expertise and perspectives were sought. Divergent and conflicting opinions are common and perceived as healthy scientific discourse that results in a thoughtful, relevant systematic review. Therefore, in the end, study questions, design, methodologic approaches, and/or conclusions do not necessarily represent the views of individual technical and content experts.

The authors gratefully acknowledge the following individuals for their contributions to this project:

Operational Partners

Operational partners are system-level stakeholders who have requested the report to inform decision-making. They recommend Technical Expert Panel (TEP) participants; assure VA relevance; help develop and approve final project scope and timeframe for completion; provide feedback on draft report; and provide consultation on strategies for dissemination of the report to field and relevant groups.

Allison Amrhein, MPH
Director of Operations, VHA Innovators Network (iNET)
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Brynn Cole
Director of Programming, VHA Innovators Network (iNET)

Technical Expert Panel (TEP)

To ensure robust, scientifically relevant work, the TEP guides topic refinement; provides input on key questions and eligibility criteria, advises on substantive issues or possibly overlooked areas of research; assures VA relevance; and provides feedback on work in progress. TEP members are listed below:

Anaïs Tuepker, PhD, MPH
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Sara Singer, PhD, MBA
Professor of Medicine, School of Medicine, and Professor of Organizational Behavior (by courtesy), Graduate School of Business and Freeman Spogli Institute for International Studies – Stanford University

Peer Reviewers

The Coordinating Center sought input from external peer reviewers to review the draft report and provide feedback on the objectives, scope, methods used, perception of bias, and omitted evidence. Peer reviewers must disclose any relevant financial or non-financial conflicts of interest. Because of their unique clinical or content expertise, individuals with potential conflicts may be retained. The Coordinating Center and the ESP Center work to balance, manage, or mitigate any potential nonfinancial conflicts of interest identified.

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Organizational culture plays a critical role in shaping healthcare delivery environments and service quality. Research is needed to identify programs and interventions that foster a culture of innovation, and to determine how culture of innovation can be evaluated and measured.

METHODS

Data Sources and Searches

We conducted broad searches using terms relating to “culture of innovation” or “culture of creativity”. We searched Web of Science, Ovid Medline, and PsycINFO from inception to 9/18/2020. We also searched the gray literature on 04/03/20 in a Google search. From these Google searches, we reviewed the first 50 hits for studies that would meet eligibility criteria.

Study Selection

Three team members working independently screened the titles of retrieved citations. Full-text review was conducted in duplicate by 2 team members, with any disagreements resolved through discussion. Because we were looking for literature that had real-world applications of culture of innovation measurement or intervention, publications were required to (1) use some specified measure or metric for culture of innovation and/or (2) describe an intervention or program to improve or establish a culture of innovation to be included.

Data Abstraction

Data extraction was completed in duplicate. All discrepancies were resolved with full group discussion. We abstracted data on the following: setting, sample size, response rate, country, study design, data analysis approach, culture of innovation metric(s), other metric(s), culture of innovation terms, culture of innovation definitions, and findings from abstract.

Data Synthesis and Analysis

Our review is a narrative analysis. We synthesized descriptions of culture of innovation definitions, metrics, and programs from included publications.

RESULTS

Results of Literature Search

We identified 480 potentially relevant citations, of which 164 were included at the abstract screening level. A total of 30 publications were identified at full-text review as meeting initial inclusion criteria: 4 publications with intervention/program and metric(s), and 26 publications with metric(s) only.

Summary of Results for Key Questions

KQ1: How is culture of innovation defined in literature related to healthcare settings?

When reviewing the included studies, there were several ways that terminology and definition captured the concept of "culture of innovation." The variations on the terminology and key words used to describe this concept were 1 source of variety. While publications varied on whether or not they described key domains or explicit definitions related to their "culture of innovation" terms, all the included publications provided relevant citations. Some common themes extracted from relevant citations include: a shared set of beliefs between people that supported improvement or change, resources to support innovation, and acceptance of change.

KQ2: What metrics are used to capture culture of innovation in healthcare settings?

Twenty-seven studies measured some version of the construct "culture of innovation" using 26 different instruments. Ten studies administered a single instrument without adaptation, 7 studies modified or truncated an existing instrument, 2 studies developed "homegrown" instruments, and 8 studies incorporated a mix of adapted, homegrown, and/or instrument without modifications. Six instruments were used in more than 1 study to measure "culture of innovation". TCI and related conceptual work were used in 7 studies, with each study incorporating the 8 items related to "support for innovation" domain within the TCI. Two additional instruments were identified among 3 studies that did not directly measure "culture of innovation". These studies instead described organizational culture using pre-specified categories. While some instruments were developed in a healthcare setting, others were adapted from other disciplines such as management and economics.

KQ3: What are key characteristics and outcomes of programs designed to improve or establish a culture of innovation in healthcare settings?

Four studies described programs that reported outcomes using a quantitative measure of culture of innovation. One publication, which described a leadership program in the UK, treated innovation climate as a primary outcome. The other 3 studies included culture of innovation as either a secondary outcome or 1 of a few various outcomes.

There were similarities between the 4 programs, but no inherent patterns were identified. Three of these studies were larger, including multiple sites, while the fourth study included a smaller sample of nurses from 1 site. Participants in 3 of the studies were frontline healthcare workers, including long-term care providers, nurses, and paramedics. The remaining study included a combination of frontline and senior management. Two programs used QICs with a specific clinical focus: 1 used QI methods to improve acute myocardial infarction and stroke care bundles and the other adapted the Instituted for Health Care Improvement Breakthrough Collaborative method to improve a specific quality topic related to long-term care. Another program incorporated a leadership program aimed at solving a "real world issue" as a group over the course of 8-10 months with a focus on a "relational and experiential approach to learning". The remaining program was a nurse-led program focused on improving nursing care in a psychiatric ward with a year-long program comprised of group clinical supervision and individual learning about how to plan and document nursing care through nursing diagnosis. While 4 studies with culture of innovation outcomes were identified, their small scale or low response rates and variable details provided about the components of each intervention limited the conclusions to be drawn.

DISCUSSION

Research Gaps/Future Research

This review identified numerous ways "culture of innovation" has been defined and measured in healthcare settings. The various ways researchers have tried to measure the construct could be a signal that "culture of innovation" is a unique concept, but more work is needed to refine the definition and critically assess the dimensions and subscales different researchers have attached to this construct.

Another area of interest for future research is to examine how teams can improve and sustain innovative culture over time and what impact innovative culture has on system, clinical, and patient outcomes. The majority of empirical research conducted in this area employed a cross-sectional study design, giving only a static view of an organization's culture of innovation at 1 point in time. Since organizational culture is dynamic and constantly evolving, incorporating longitudinal approaches may capture a more complex picture, including an examination of causal relationships between culture of innovation and system, clinical, and patient outcomes.

CONCLUSIONS

While we were able to identify a moderate amount of literature defining and quantitatively measuring culture of innovation in healthcare settings, this area of research has yet to see rigorous evaluations of intervention work or process of changing culture. A culture of innovation in a healthcare organization may have implications for quality of care, population health outcomes, cost of care, and employee satisfaction. An organization exhibiting a culture of innovation may be more likely to have an orientation towards improvement and the ability to continuously adapt to changing environment. More work is needed to understand how to build a culture of innovation in healthcare settings and harness the benefits of culture of innovation to improve key outcomes.

EVIDENCE REPORT

INTRODUCTION

Organizational culture plays a critical role in shaping healthcare delivery environments and service quality. Organizational culture may be defined as shared basic assumptions, values, and beliefs that characterize a setting and influence practices, routines, and priorities.[1, 2] There are multiple facets of organizational culture (*eg*, safety culture, innovation culture), and scholarship has increasingly acknowledged the value of focusing on specific types.[3, 4] Cultures that value and support innovation can foster innovative behaviors, which in turn are associated with positive staff and patient outcomes.[1, 5] One such culture is a culture of innovation.

Prior efforts have sought to synthesize existing models and describe characteristics of organizational culture that supports innovation.[6] However, additional work focusing on the practical application of these concepts and relationships in real-world settings is needed. For example, more research is needed to identify programs and interventions that foster a culture of innovation, and to determine how culture of innovation can be evaluated and measured.

This report seeks to extend beyond that by examining 3 key questions:

KQ1: How is culture of innovation defined in literature related to healthcare settings?

KQ2: What metrics are used to capture culture of innovation in healthcare settings?

KQ3: What are key characteristics and outcomes of programs designed to improve or establish a culture of innovation in healthcare settings?

METHODS

TOPIC DEVELOPMENT

This topic was developed in response to a nomination by Allison Amrhein, MPH, Director of Operations at VHA Innovators Network and Brynn Cole, BA, Director of Programming at VHA Innovators Network. Key questions were then developed with input from the topic nominator, the ESP Coordinating Center, the review team, and the technical expert panel (TEP). The Key Questions were:

KQ1: How is culture of innovation defined in literature related to healthcare settings?

KQ2: What metrics are used to capture culture of innovation in healthcare settings?

KQ3: What are key characteristics and outcomes of programs designed to improve or establish a culture of innovation in healthcare settings?

SEARCH STRATEGY

We conducted broad searches using terms relating to "culture of innovation" or "culture of creativity". We searched Web of Science, Ovid Medline, and PsycINFO from inception to 9/18/2020. See Appendix A for complete search strategy.

We also searched the gray literature on 04/03/20, starting with terms like "building a culture of innovation" in a Google search and then also using the Google-generated search terms "7 ways to create a culture of innovation", "creating an innovation culture McKinsey", "how to drive innovation culture", "culture innovation examples", "how to foster innovation culture", "organizational culture and innovation", "culture strategy innovation", and "how to measure innovation culture." From these searches, we reviewed the first 50 hits for studies that would meet eligibility criteria.

STUDY SELECTION

Three team members working independently screened the titles of retrieved citations. For titles deemed relevant by at least 1 person, abstracts were then screened independently in duplicate by 2 team members. All disagreements were reconciled through group discussion. Full-text review was conducted in duplicate by 2 team members, with any disagreements resolved through discussion. Because we were looking for literature that had real-world applications of culture of innovation measurement or intervention, publications were required to (1) use some specified measure or metric for culture of innovation and/or (2) describe an intervention or program to improve or establish a culture of innovation to be included. See Appendix C for screening criteria.

DATA ABSTRACTION

Data extraction was completed in duplicate. All discrepancies were resolved with full group discussion. We abstracted data on the following: setting, sample size, response rate, country, study design, data analysis approach, culture of innovation metric(s), other metric(s), culture of

innovation terms, culture of innovation definitions, and findings from abstract. See Appendix C for data abstraction form.

QUALITY ASSESSMENT

Typically, quality assessments are used to describe the risk of bias for outcomes from the evaluation of an intervention. As the majority of our studies did not include interventions, this would not help describe the body of literature we identified overall, nor would it help readers interpret key questions 1 or 2. We were not able to identify an existing assessment or determine a set of criteria that would be suitable to assess quality for studies defining culture of innovation or using a metric, as is the focus of these 2 questions. While there are quality assessment criteria for the development of a metric,[7] which are used for a primary study developing an instrument, not all our included studies described this process, so these criteria would be inappropriate for studies describing fielding of an existing instrument.

We do describe key characteristics of the included studies, most notably including description of the sample size and response rate, which is key information the audience would need to be able to assess credibility of the included studies.

For the subset of intervention studies, we describe the major risks of bias and their considerable impact on the interpretation of the studies narratively.

DATA SYNTHESIS

Our review is a narrative analysis. We synthesized descriptions of culture of innovation definitions, metrics, and programs from included publications.

PEER REVIEW

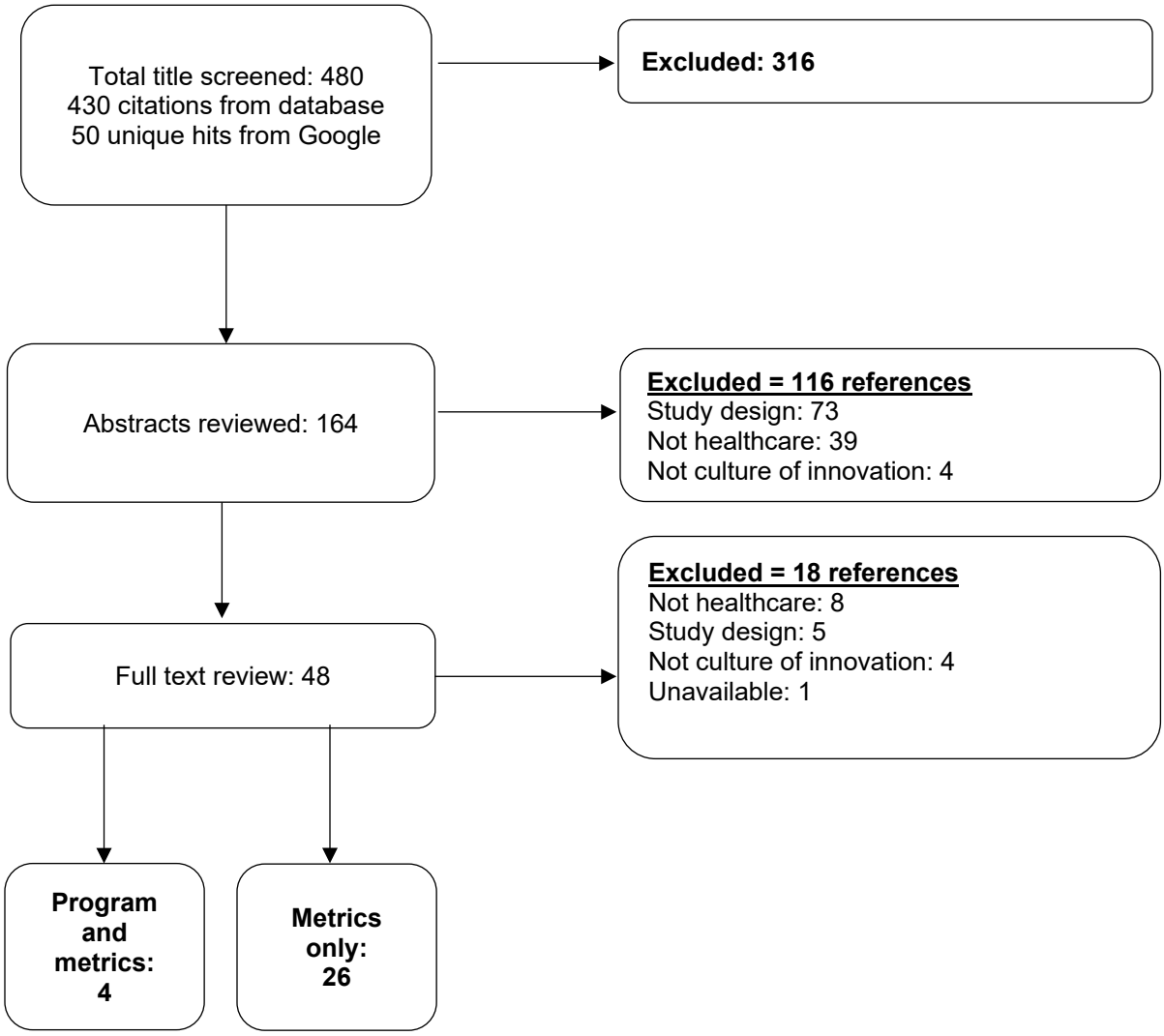
A draft version of the report was reviewed by technical experts and clinical leadership. Reviewer comments and our response are documented in Appendix B.

RESULTS

LITERATURE FLOW

We identified 480 potentially relevant citations, of which 164 were included at the abstract screening level. From these, a total of 116 abstracts were excluded: study design (n=73), not healthcare (n=39), and not culture of innovation (n=4). This left 48 publications for full-text review, of which 18 were excluded for the following reasons: not healthcare (n=8), study design (n=5), not culture of innovation (n=4), and unavailable (n=1). A full list of excluded studies from the full-text review is included in Appendix G. A total of 30 publications were identified at full-text review as meeting initial inclusion criteria: 4 publications with intervention/program and metric(s), and 26 publications with metric(s) only. See Figure 1 for literature flow. Descriptions of included publications are available in the Evidence Table (Appendix F).

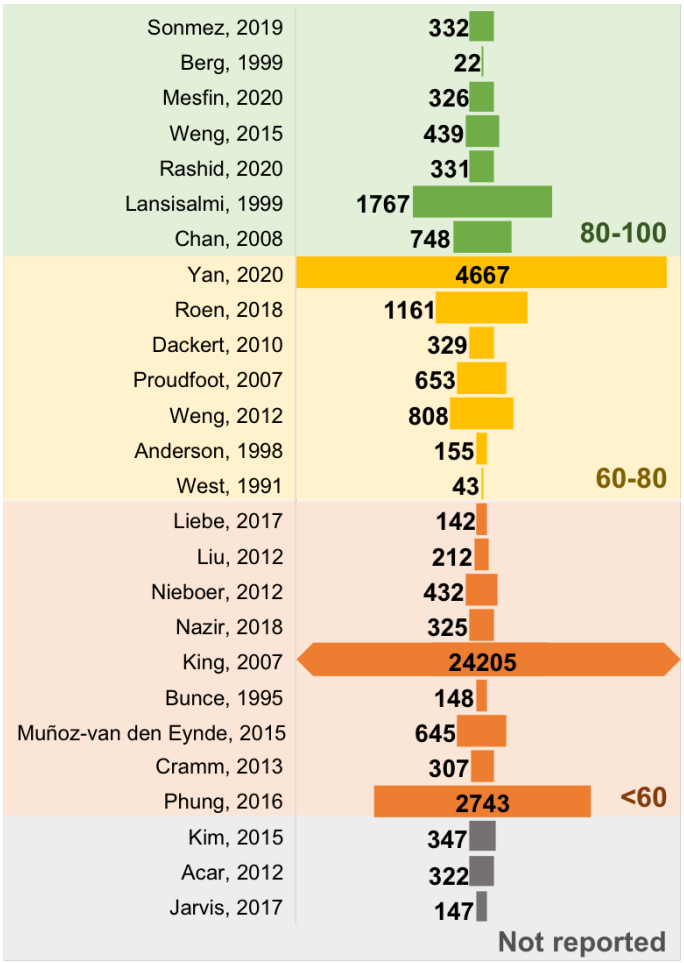
Figure 1. Literature Flow Chart



DESCRIPTION OF THE EVIDENCE

We identified 30 publications that met the inclusion criteria. None were randomized controlled trials. One meta-analysis was included.[3] The majority of studies employed the cross-sectional design; 2 studies imposed a pre-post study design[8, 9] and 2 studies used a repeated measures design.[10, 11] One of the included studies was a meta-analysis of 43 studies presenting data for 6341 organizations. In terms of analysis approach, 3 studies provided descriptive statistics only, 20 studies presented descriptive statistics and some sort of quantitative analysis (*ie,* structural equation modeling, hierarchical linear modeling, linear regression, *etc*). Four studies included programs or interventions about a culture of innovation.[8, 11-13] See Appendix F Evidence Tables with more detailed descriptions of individual studies.

Figure 2. Studies with Individual Respondent Sample Size Categorized by Response Rate



Included studies originated from 15 different countries: the United Kingdom (n=7), United States (n=3), Taiwan (n=3), Turkey (n=3), China (n=2), Sweden (n=2), the Netherlands (n=2), and 1 study each from Australia, Ethiopia, Finland, Germany, Norway, Pakistan, South Korea, and Spain. Twenty-six studies were multi-site and 4 were single site. Sample size ranged from 22 to 24,205 for individuals, from a range of 11 to 175 teams or groups. Excluding studies with no individual response rates[14-16] and the meta-analysis,[3] 7 studies reported response rate of 80% of

higher, 7 studies reported response rate of 60-80%, 9 studies reported under 60% response rate, and 3 studies did not report response rate (Figure 2).[17]

KEY QUESTION 1 – HOW IS CULTURE OF INNOVATION DEFINED IN LITERATURE RELATED TO HEALTHCARE SETTINGS?

When reviewing the included studies, there were several ways that terminology and definition captured the concept of "culture of innovation." The variations on the terminology and key words used to describe this concept were 1 source of variety. In addition, some studies provided explicit definitions or explanations of culture of innovation. Finally, nearly all the publications provided citations related to the concept of culture of innovation. For details on each of the studies and the terms, definitions, and citations they used, please see Appendix D.

Four studies used the term "innovative behavior" as the phrase related to culture of innovation.[12, 16, 18, 19] The next most common term was "innovative culture", which was used by 3 studies.[8, 20, 21] Four terms were used by 2 studies: "the adhocracy culture",[22, 23] "innovative organizational culture",[19, 24] "culture for innovation",[15, 16] and "support for innovation".[10, 25] There were 18 additional terms used by the included studies, many of which used variants of the same key words.

Because many terms were variants on the same language, we also looked for patterns in the key words used. Variants of the word "innovation," which itself had 14 uses, were used 29 times. The word "culture" was used 12 times, whereas "climate" was used 8 times. Words invoking the collective nature of the concept were also common: "organizational" (n=6), "team"/"teams" (n=3), and "workgroup"/"groups" (n=2). The word "behavior" appeared 5 times. Variations on "support" were used by 4 studies. Some additional terms were used only once, or, in the case of "adhocracy", twice. The word cloud below includes all variants of terms used, with their size proportional to the number of uses (Figure 3).

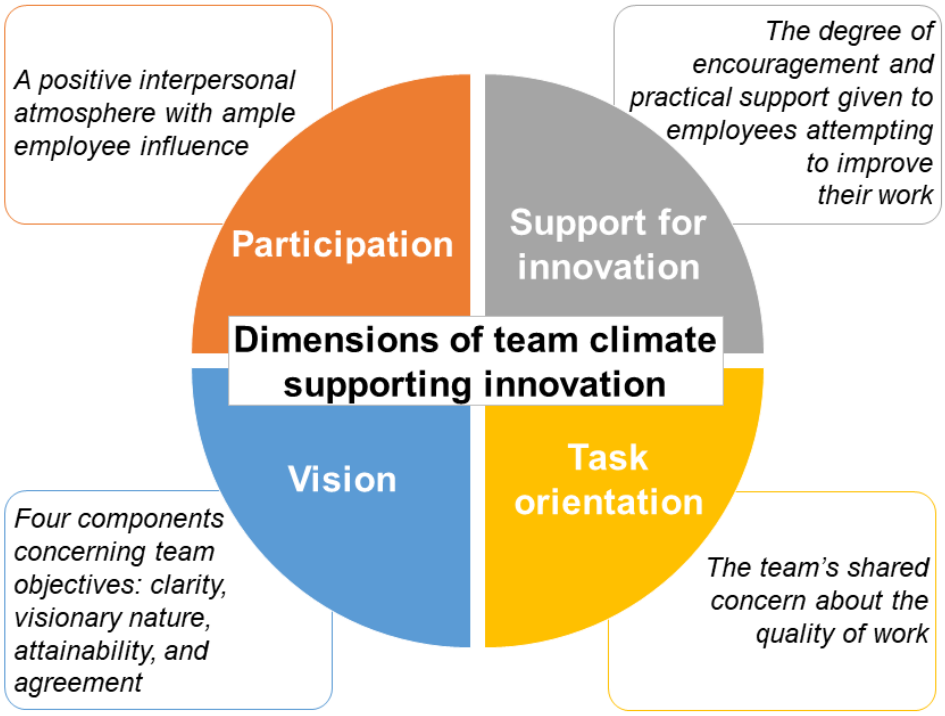
Figure 3. Words Used in Key "Culture of Innovation" Terms

While publications varied on whether or not they described key domains or explicit definitions related to their "culture of innovation" terms, all the included publications provided relevant

citations. The narrative descriptions of the terms, including definitions, domains or other narrative context for the use of the term, are provided in Appendix D. There were 171 unique citation provided among the included studies, with 20 citations cited more than once. While many were used only once and may only apply to specific clinical professions or settings, the works of Anderson and West,[26] Scott and Bruce,[27] and Caldwell and O'Reilly[28] appeared numerous times and stood out as noteworthy exceptions in their more consistent use.

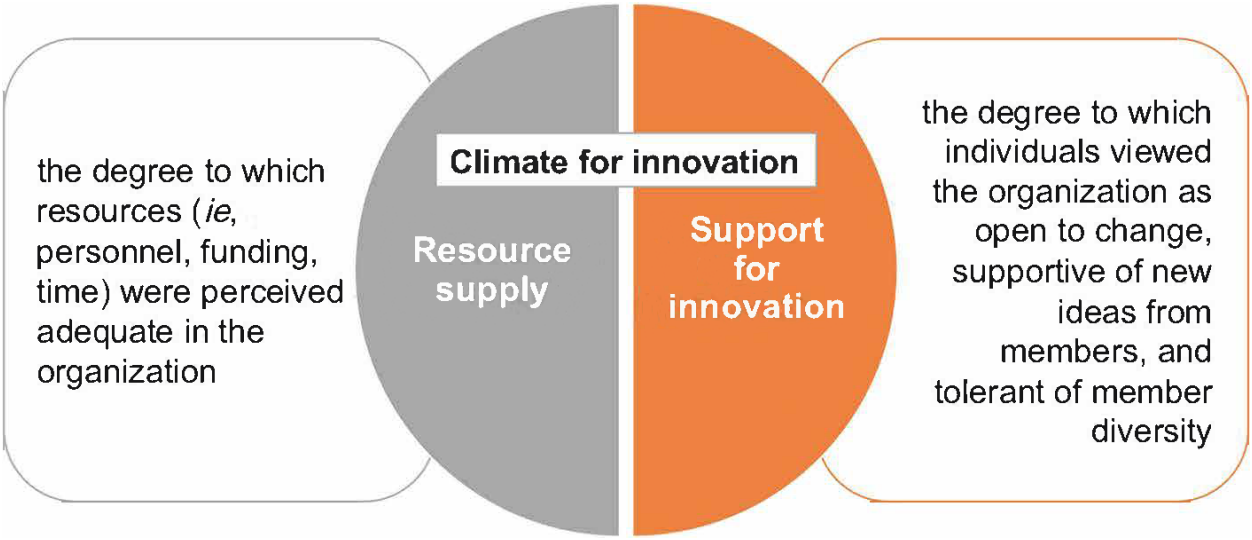
While the specific citations may have varied somewhat, nearly all studies related to Anderson and West referred to the "Support for Innovation" domain of the Team Climate Inventory metric, described in more detail under Key Question 2, below.[26] The 4 dimensions—support for innovation, vision, task orientation, participation—and their definitions are detailed in Figure 4.

Figure 4. Dimensions of Support for Innovation, Defined by Anderson and West[26]



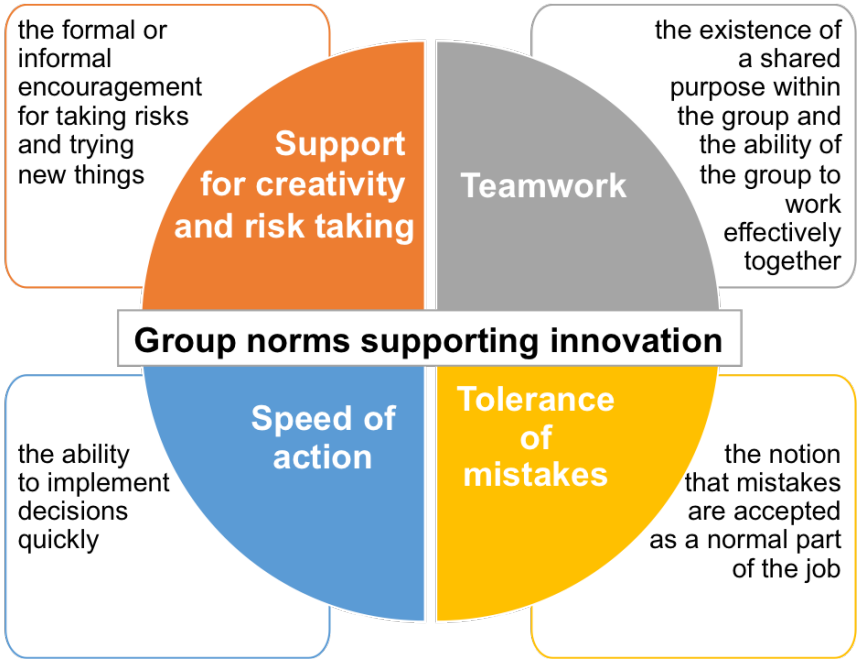
Scott and Bruce "viewed individual innovative behavior as the outcome of 4 interacting systems—individual, leader, work group, and climate for innovation".[27] Adapting the work of Siegel and Kaemmerer, Scott and Bruce included 2 dimensions in their definition of "climate for innovation": resource supply and support for innovation. The climate for innovation domain is described in more detail under Key Question 2, below.[27] The 2 dimensions and their definitions are detailed in Figure 5.

Figure 5. Dimensions of Climate for Innovation[27]



Caldwell and O'Reilly examined "group variables associated with innovation, particularly norms that develop within a group."[28] They identified social variables related to innovation from case examples which provided "an understanding of the actual experience of teams in organizations and…a broad range of attributes associated with innovation in teams." Their work is premised on "the assumption that innovation requires both the development of creative responses and the ability to implement them." Four domains emerged from their investigation – support for creativity and risk taking, teamwork, speed of action, and tolerance of mistakes – and are described in more detail under Key Question 2, below.[28] The 4 dimensions and their definitions are detailed in Figure 6.

Figure 6. Group Norms Supporting Innovation[28]



These 3 examples are highly representative of the definitions overall, and there seems to be a loose consensus around the definition for “culture of innovation”. Some common themes extracted from relevant citations include: a shared set of beliefs between people that supported improvement or change, resources to support innovation, and acceptance of change.

KEY QUESTION 2 – WHAT METRICS ARE USED TO CAPTURE CULTURE OF INNOVATION IN HEALTHCARE SETTINGS?

Twenty-seven studies reported using 26 different instruments to measure some version of the construct "culture of innovation". Nineteen studies employed 1 instrument: 10 studies used an instrument without adaptations,[9, 11, 14, 15, 20, 24, 25, 29-31] 7 studies modified an existing instrument,[8, 26, 32-36] and 2 studies developed a "homegrown" instrument.[21, 37] Eight studies used more than 1 instrument: 1 study adapted an existing instrument and added a "homegrown" composite innovation score;[10]2 studies employed 2 complete instruments;[19, 38]3 studies used 2 modified instruments;[12, 16, 23] 1 study developed 2 "homegrown" instruments;[18] and 1 study employed an instrument in its entirety and developed 2 "homegrown" innovation scores.[39] While some were developed in a healthcare setting, others were adapted from other disciplines such as management and economics.[28, 40-42] Six instruments were employed to measure "culture of innovation" in more than 1 included study.[27, 28, 43-45] See Appendix E for a crosswalk denoting studies and the instruments they used.

Seven studies[10, 16, 25, 30, 32, 33, 36] employed Team Climate Inventory (TCI), developed by Anderson & West.[26] The TCI was based on the 4-factor model of work group innovation developed by West,[46] which hypothesized that vision, participative safety, task orientation, and support for innovation are predictive of innovativeness. The 38-item self-report questionnaire measured team climate among healthcare management teams and it is intended to provide an aggregate measure of climate of innovation at the group level.

Two of the 7 studies administered the full TCI,[25, 30] while 4 studies only included 8 items from 1 of TCI's domains, Support for Innovation.[10, 16, 32, 33] One study created a 9-item instrument to measure "climate for innovation" by adding an item from Patterson et al[47] to the 8-item "support for innovation".[36]

The items in the "Support for Innovation" domain (Figure 7) examined "the extent to which respondents [felt] a climate encouraging innovation, and new and improved way of doing things, exists in their work groups."[10] There are 2 subscales in the domain: 4 items from Siegel and Kaemmerer's climate for innovation measure, "designed to assess organizational level attributes",[48] and 4 items developed by Anderson and West to "tap enacted support for innovation, [which] assessed the extent to which time, cooperation, practical support and resources were given by team members to implement new ideas and proposals."[26]

Figure 7. Support for Innovation Items from the Team Climate Inventory

Scott and Bruce devised the Climate for Innovation Measure to assess "individual differences with respect to the perception of the innovative climate in an organization".[27] They developed a 22-item instrument with 2 subscales and surveyed employees of a large non-healthcare industrial facility in the United States. The 2 subscales are: support for innovation (16 items) and resource supply (6 items). The support for innovation domain was adapted from Siegel and Kaemmerer's 26-item instrument, Climate for Innovation.[45] Another measure developed within the same study was the Innovative Behavior measure, which was used by 2 included studies[12, 38] to measure innovative work behavior (IWB). Consisting of 6 items under a single subscale, this measure assessed the tendency of employees to exhibit innovative behavior.[27]

The National Health Service's culture of innovation instrument,[49] developed by the NHS Institute for Innovation and Improvement, was used by 2 included studies seeking to measure culture of innovation.[15, 29] The 7-dimension instrument measured "the degree to which there are resources, support, and rewards for innovation within practices".[15] Organization culture for innovation was measured on 7 dimensions: risk, resources, information, targets, tools, reward, and relationships.

Two studies[8, 20] employed Group Innovation Inventory (GII), a 36-item instrument aimed "to identify the pattern of norms fostering innovation" with 4 domains: creativity and risk taking (9 items), teamwork (7 items), speed of action (4 items), and tolerance of mistakes (5 items).[28] Caldwell and O'Reilly developed the GII by asking a large sample of non-healthcare senior-level managers from Asia, Europe, Africa, and the United States to identify "norms or expectations that if widely held would facilitate innovation."[28] Responses were summarized and formed the basis of the instrument, reflecting "the informal expectations, beliefs, and group processes seen as important for fostering innovation."[28]

Other studies reported using instruments without adaptations.[9, 11, 14, 19, 20, 24, 31, 38, 39] Instruments employed include Innovative Work Behavior (Scott & Bruce),[38] Situational Outlook Questionnaire (SOQ),[11] Group Innovation Inventory,[20] Creative Climate Questionnaire (CCQ),[9] Climate for Innovation (Siegel & Kaemmerer),[39] instruments to measure individual innovative behaviors (Kleysen & Street) and innovative organization culture,[19] an instrument to measure

innovation capability of Chief Information Officers (Esdar),[24] an instrument to measure development culture (Tseng & Lee),[14] and Nurse Organizational Innovation Climate Scale.[31]

Five studies developed "homegrown" instruments: a composite innovation score,[10] a total innovation score and a role innovation score,[39] 2 instruments to measure "innovation climate" and "nursing innovation behavior",[18] an instrument to measure "nursing innovation",[37] and Radiography of Innovation Culture-Multidimensional Questionnaire (RIC-MQ) to measure "innovative culture".[21]

Several studies employed adapted or truncated versions of existing instruments.[8, 10, 12, 16, 23, 26, 32-36] The most frequently adapted instrument is the TCI, discussed above.[10, 16, 32, 33, 36] Some studies adapted items from existing instruments,[10, 12, 23, 35] while other studies incorporated parts of validated instruments such as Group Innovation Inventory,[8] Nordic Questionnaire for Psychosocial and Social Factors at Work,[34] Climate for Innovation developed by Scott & Bruce,[16] and Climate for Innovation developed by Siegel and Kaemmerer.[26]

Three of the 30 included studies did not directly measure "culture of innovation" but administered instruments to describe organizational culture using pre-specified categories. Two of the studies used the Competing Values Framework (CVF),[3, 50] while the third study used the Organizational Culture Assessment Instrument (OCAI), which is derived from CVF.[22] The CVF can be used to explain "the relationships of culture traits with innovation"[3] and identify implications of each culture type on organizational culture.[22] The most common organizational culture found for innovative organizations is the adhocracy (creative or development) culture, which emphasizes "an external and a flexibility orientation."[3]

KEY QUESTION 3 – WHAT ARE KEY CHARACTERISTICS AND OUCOMES OF PROGRAMS DESIGNED TO IMPROVE OR ESTABLISH A CULTURE OF INNOVATION IN HEALTHCARE SETTINGS?

Four studies described programs that reported outcomes using a quantitative measure of culture of innovation.[8, 9, 11, 29] One publication, which described a leadership program in the UK, treated innovation climate as a primary outcome.[11] The other 3 studies included culture of innovation as either a secondary outcome or 1 of a few various outcomes. Three of these studies were larger, including multiple sites,[8, 11, 29] while the final study included a smaller sample of nurses from 1 site.[9] Participants in 3 of the studies were frontline healthcare workers, including long-term care providers,[8] nurses,[9] and paramedics.[29] The final study included a combination of frontline and senior management.[11] Each of these studies is described in further detail below.

Our review found multiple related studies from the UK's National Health System (NHS), including 1 leadership learning program (Figure 8).[11] The goal of the study was to "explore the role leadership learning can play in supporting a climate for innovation", which followed 5 cohorts from senior manager and frontline manager training programs. These 2 programs had similar structures, meeting over the course of 8-10 months for module activities, coaching, evaluation activities, and working as a group to solve a real-world issue. Climate for innovation outcome data were collected from 24 of the 148 program participants. The respondents and their teams completed the Situational Outlook Questionnaire (SOQ) before and after completing the program. Additional data were collected from interviews and surveys around the sustainability and influence of the program's training on dimensions such as conflict and trust and risk-taking. While the response rate (16%) is very low, this study does signal some potential benefits of leadership training in improving dimensions of climate for innovation including challenge/involvement, freedom, trust/openness, idea-time, playfulness/humor, idea-support, debate, and risk-taking.

Figure 8. Leadership Learning Program

Two studies examined quality improvement collaboratives (QIC) (Figure 9).[8, 29] QICs were created to "improve quality in a specific area of practice, with expert support, involving multi-professional teams from multiple sites working collaboratively and using quality improvement methods."[51] The first QIC study included 22,117 paramedics in 12 ambulance services in the UK, and was focused on training participants on quality improvement (QI) methods and applying these methods to improve acute myocardial infarction and stroke care bundles. The clinical outcomes from this QIC were published separately, and the focus of the included study was on culture of innovation, leadership behavior, and uptake of QI methods. The 2,743 paramedics responding to a survey (12% response rate, from 11 of 12 ambulance services) suggest that participation in the QIC may improve uptake of QI methods and leadership behavior. The second QIC, comprised of 12 collaboratives, adapted the Institute for Healthcare Improvement Breakthrough Collaborative method and "focused on improving 1 specific quality topic [related

to long-term care] varying from malnutrition to process redesign".[8] The analyses compared data collected before and after the collaborative, with 307 of the 1,161 participants included in the analysis (26% response rate). Findings suggest that QIC participation may not improve innovative culture, but other factors like perceived effectiveness of the QIC, organizational support, and management support played an important role in predicting innovative culture.

Figure 9. Quality Improvement Collaboratives

The final study that included a program was a clinical supervision intervention at 1 general psychiatric ward in Sweden, including 22 nurses (Figure 10).[9] This intervention involved 1 year of systematic group clinical supervision, using Hallberg's model,[52] and each participant supervised individually on how to plan and document nursing care through nursing diagnosis.[53] All 22 nurses completed the Sense of Coherence scale, the Creative Climate Questionnaire (CCQ), the Work-Related Strain Inventory, and the Satisfaction with Nursing Care and Work Questionnaire before and after implementation of the clinical supervision. This small, single site study found increases in some creative and innovative climate dimensions, but their overall findings were mixed.

Figure 10. Clinical Supervision Intervention

There were similarities between the 4 programs, but no inherent patterns were identified. Three of these studies were larger, including multiple sites, while the fourth study included a smaller sample of nurses from 1 site. Participants in 3 of the studies were frontline healthcare workers, including long-term care providers, nurses, and paramedics. The remaining study included a combination of frontline and senior management. Two programs used QICs with a specific clinical focus: 1 used QI methods to improve acute myocardial infarction and stroke care bundles and the other adapted the Instituted for Health Care Improvement Breakthrough Collaborative method to improve a specific quality topic related to long-term care. Another program

incorporated a leadership program aimed at solving a “real world issue” as a group over the course of 8-10 months with a focus on a “relational and experiential approach to learning”. The remaining program was a nurse-led program focused on improving nursing care in a psychiatric ward with a year-long program comprised of group clinical supervision and individual learning about how to plan and document nursing care through nursing diagnosis. While 4 studies with culture of innovation outcomes were identified, their small scale or low response rates and variable details provided about the components of each intervention limited the conclusions to be drawn.

DISCUSSION

In this systematic review we describe how "culture of innovation" has been defined and measured in studies that have measured or sought to improve or establish a "culture of innovation" in healthcare settings. We identified 4 programs with culture of innovation outcomes.

SUMMARY OF KEY QUESTIONS

KQ1: How is culture of innovation defined in literature related to healthcare settings?

When reviewing the included studies, there were several ways that terminology and definition captured the concept of "culture of innovation." The variations on the terminology and key words used to describe this concept were 1 source of variety. In addition, some studies provided explicit definitions or explanations of culture of innovation; nearly all the publications provided citations related to the concept of culture of innovation. The works of Anderson and West,[26] Scott and Bruce,[27] and Caldwell and O'Reilly[28] appeared numerous times and stood out as noteworthy exceptions in their more consistent use.

While the specific citations may have varied somewhat, nearly all studies related to Anderson and West referred to the "Support for Innovation" domain of the Team Climate Inventory (TCI). The other 3 domains are vision, participation, and task orientation.[26] Scott and Bruce included 2 dimensions in their definition of "climate for innovation": resource supply and support for innovation. Caldwell and O'Reilly examined "group variables associated with innovation, particularly norms that develop within a group."[28] Four domains emerged from their work: support for creativity and risk taking, teamwork, speed of action, and tolerance of mistakes.

These 3 examples are highly representative of the definitions overall, and there seems to be a loose consensus around the definition for "culture of innovation". Some common themes extracted from relevant citations include: a shared set of beliefs between people that supported improvement or change, resources to support innovation, and acceptance of change.

KQ2: What metrics are used to capture culture of innovation in healthcare settings?

Twenty-seven studies measured some version of the construct "culture of innovation" using 26 different instruments. Ten studies administered a single instrument without adaptation, 7 studies modified or truncated an existing instrument, 2 studies developed "homegrown" instruments, and 8 studies incorporated a mix of adapted, homegrown, and/or instrument without modifications. Six instruments were used in more than 1 study to measure "culture of innovation". TCI and related conceptual work were used in 7 studies, with each study incorporating the 8 items related to "support for innovation" domain within the TCI. Two additional instruments were identified among 3 studies that did not directly measure "culture of innovation". These studies instead described organizational culture using pre-specified categories. While some instruments were developed in a healthcare setting, others were adapted from other disciplines such as management and economics.

KQ3: What are key characteristics and outcomes of programs designed to improve or establish a culture of innovation in healthcare settings?

Four studies described programs that reported outcomes using a quantitative measure of culture of innovation. One publication, which described a leadership program in the UK, treated innovation climate as a primary outcome. The other 3 studies included culture of innovation as either a secondary outcome or one of a few various outcomes.

There were similarities between the 4 programs, but no inherent patterns were identified. Three of these studies were larger, including multiple sites, while the fourth study included a smaller sample of nurses from 1 site. Participants in 3 of the studies were frontline healthcare workers, including long-term care providers, nurses, and paramedics. The remaining study included a combination of frontline and senior management. Two programs used QICs with a specific clinical focus: 1 used QI methods to improve acute myocardial infarction and stroke care bundles and the other adapted the Instituted for Health Care Improvement Breakthrough Collaborative method to improve a specific quality topic related to long-term care. Another program incorporated a leadership program aimed at solving a "real world issue" as a group over the course of 8-10 months with a focus on a "relational and experiential approach to learning". The remaining program was a nurse-led program focused on improving nursing care in a psychiatric ward with a year-long program comprised of group clinical supervision and individual learning about how to plan and document nursing care through nursing diagnosis. While 4 studies with culture of innovation outcomes were identified, their small scale or low response rates and variable details provided about the components of each intervention limited the conclusions to be drawn.

LIMITATIONS

Publication Bias

We were not able to test for publication bias and can make no conclusions about its possible existence. However, we supplemented our database search with a Google search to locate possible publications not indexed in traditional databases or published in healthcare journals. The primary challenge for topics without a specific disease or therapy is identifying relevant literature. Because terminology related to culture of innovation is evolving, there are no reliable, standardized terms for systematically searching databases for literature related to this topic, so relevant literature might have been missed. In addition, every healthcare organization has its own culture that is fluid and dynamic, but these changes are not measured/quantified or evaluated, so there are likely real-world examples of successful implementations of innovative culture that are not represented here.

There are several challenges common in literature synthesis studies that also affect this review. The lack of program studies with rigorous study designs limits our ability to draw conclusions about the causal effect of the programs identified on culture of innovation. The low response rates (or no response rate reported) in the majority of studies, especially the program studies identified in KQ3, also introduce uncertainty and potential bias. There is also large variation in the manner in which culture of innovation has been measured. Despite the similarities in how culture of innovation and related constructs were operationalized across studies, there are also vast differences that made interpreting results across studies challenging.

While "culture" and "climate" or "creativity" and "innovation" are often used interchangeably, some researchers have distinguished between these terms in prior literature. Culture is more "observable in the practices and policies of the organization",[54] while climate refers to "the behavioral evidence for the culture within an organization".[55] Creativity "focuses on the individual thought processes and intellectual activity to general new insights, ideas, or solutions to problems"; innovation extends beyond this notion of creativity by focusing on "the adoption, exploitation and successful implementation of these insights, ideas, or solutions to problems".[56] The distinctions between these terms are nuanced but could be important when attempting to identify facilitators and moderators of culture of innovation. Since the goal of this review is to present the breadth of how culture of innovation has been characterized in healthcare settings, our resulting language may lack definitional clarity.

Applicability of Findings to the VA

None of the identified literature in our searches came from the VA, but there is increasing interest in the concept of culture of innovation and measurement within the VA.[6, 57] Many healthcare systems are invoking the term "innovation" in programs; however, they vary in their scope, function, and purpose. There are institutions offering competition-type events to encourage advancement of solutions and ideas to improve the quality of healthcare and to build employee capacity through education and training, such as programs at Brigham and Women's Hospital (Brigham Digital Innovation Hub) and the Henry Ford Innovation Institute. Other institutions, such as Seattle Children Improvement and Innovation (SCII) program or the University of Chicago Center for Healthcare Delivery Science and Innovation, partner with companies to help solve issues facing patients, families, and clinicians with innovative solutions. We were unable to identify evaluations of these programs that described their impact on culture of innovation.

There were only a small number of studies identified within published literature with metrics and interventions. Of those programs that have been published with measurable culture of innovation outcomes,[8, 9, 11, 29] the studies conducted at United Kingdom's National Health Service (NHS) would best approximate the VA's setting, given the scale of the organization and the type of work NHS has been doing. The NHS' sustained work may be the best place for the VA to gain insight.

RESEARCH GAPS AND RECOMMENDATIONS FOR FUTURE RESEARCH

This review identified numerous ways "culture of innovation" has been defined and measured in healthcare settings. The various ways researchers have tried to measure the construct could be a signal that "culture of innovation" is a unique construct. Broadening the search strategy would likely reveal the overlap between culture of innovation and other related constructs, such as organizational learning and patient safety culture. More work is needed to refine the definition and critically assess the dimensions and subscales different researchers have attached to this construct.

There is also overlap between research on fostering leadership and research on fostering innovation. One of the included studies from NHS where a leadership training program used innovation climate as an outcome is a strong example of this.[11] Questions such as whether some

concepts of innovation rely more on innovation from "above" by individuals in formal leadership positions, or if there are other concepts/approaches to innovation rely more on distributed leadership/initiative from “below” are interesting for future research.

There is an increasing body of work dedicated to the understanding of how organizational culture affects team composition and function. Our review included studies discussing development culture, which has been shown to promote innovation and continuous adaptation to changing environment.[14] More work is needed to examine the relationship between healthcare team composition and culture of innovation.

Another area of interest for future research is to examine how teams can improve and sustain innovative culture over time and what impact innovative culture has on system, clinical, and patient outcomes. How to evaluate and assess effectiveness of programs and interventions implemented to improve or cultivate a culture of innovation is also of interest. As discussed, the majority of empirical research conducted in this area employed a cross-sectional study design, giving only a static view of an organization’s culture of innovation at 1 point in time. Since organizational culture is dynamic and constantly evolving, incorporating longitudinal approaches may capture a more complete picture. Moreover, longitudinal study design would allow for examination of causal relationships between culture of innovation and system, clinical, and patient outcomes.

CONCLUSIONS

While we were able to identify a moderate amount of literature defining and quantitatively measuring culture of innovation in healthcare settings, this area of research has yet to see rigorous evaluations of intervention work or process of changing culture. Such studies would require multi-site studies with large sample sizes and may build from the early work in this area to focus on interpersonal dynamics, leadership, and/or quality improvement collaboratives.

A culture of innovation in a healthcare organization may have implications for quality of care, population health outcomes, cost of care, and employee satisfaction. An organization exhibiting a culture of innovation may be more likely to have an orientation towards improvement and the ability to continuously adapt to changing environment. More work is needed to understand how to build a culture of innovation in healthcare settings and harness the benefits of culture of innovation as the link between effective organizational practice and high-quality healthcare, thus improving system, clinical, and patient outcomes.

REFERENCES

1. Glisson C. The Role of Organizational Culture and Climate in Innovation and Effectiveness. *Hum Serv Organ Manag Leadersh Gov*. 2015;39(4):245-250. doi:10.1080/23303131.2015.1087770
2. Schneider B., Ehrhart MG, W. M. Organizational climate and culture. *Annu Rev Psychol*. 2013;64(361-388)
3. Büschgens T, Bausch A, Balkin DB. Organizational culture and innovation: A meta-analytic review. *Journal of product innovation management*. 2013;30(4):763-781.
4. Singer SJ, Falwell A, Gaba DM, et al. Identifying organizational cultures that promote patient safety. *Health Care Manage Rev*. Oct-Dec 2009;34(4):300-11. doi:10.1097/HMR.0b013e3181afc10c
5. Hogan SJ, Coote LV. Organizational culture, innovation, and performance: A test of Schein's model. *Journal of Business Research*. 2014;67(8):1609-1621.
6. Greene J, Yuthas K, A. T. *Training for innovation: evidence to inform evaluation of the VA Innovators Network*. 2017.
7. Mokkink LB, de Vet HCW, Prinsen CAC, et al. COSMIN Risk of Bias checklist for systematic reviews of Patient-Reported Outcome Measures. *Qual Life Res*. May 2018;27(5):1171-1179. doi:10.1007/s11136-017-1765-4
8. Cramm JM, Strating MMH, Bal R, Nieboer AP. A large-scale longitudinal study indicating the importance of perceived effectiveness, organizational and management support for innovative culture. *Social science & medicine (1982)*. 2013;83:119-24. doi:https://dx.doi.org/10.1016/j.socscimed.2013.01.017
9. Berg A, Hallberg IR. Effects of systematic clinical supervision on psychiatric nurses' sense of coherence, creativity, work-related strain, job satisfaction and view of the effects from clinical supervision: a pre-post test design. *Journal of psychiatric and mental health nursing*. 1999;6(5):371-81.
10. Bunce D, West MA. Self perceptions and perceptions of group climate as predictors of individual innovation at work. *Applied Psychology: An International Review*. Jul 1995. 2017-09-25 1995;44(3):199-215. doi:http://dx.doi.org/10.1111/j.1464-0597.1995.tb01076.x
11. Jarvis C, Kars S, Sheffield R. Healthy Returns: Leadership Learning and Innovation Climate in the UK Health Sector. *Proceedings of the 12th European Conference on Innovation and Entrepreneurship*. Acad Conferences Ltd; 2017:330-339. *Proceedings of the European Conference on Entrepreneurship and Innovation*.
12. Nazir S, Qun W, Hui L, Shafi A. Influence of Social Exchange Relationships on Affective Commitment and Innovative Behavior: Role of Perceived Organizational Support. Article. *Sustainability*. Dec 2018;10(12)doi:10.3390/su10124418
13. *Human performance technology: Concepts, methodologies, tools, and applications*. Business Science Reference/IGI Global, Hershey, PA; 2019:1946-Chapter xxxix, 1946 Pages.

14. Gozukara I, Colakoglu N, Simsek OF. Development culture and TQM in Turkish healthcare: importance of employee empowerment and top management leadership. Article. *Total Quality Management & Business Excellence*. Aug 2019;30(11-12):1302-1318. doi:10.1080/14783363.2017.1366266

15. Apekey TA, McSorley G, Tilling M, Siriwardena AN. Room for improvement? Leadership, innovation culture and uptake of quality improvement methods in general practice. *Journal of evaluation in clinical practice*. 2011;17(2):311-8. doi:https://dx.doi.org/10.1111/j.1365-2753.2010.01447.x

16. Nowak R. Responding to Key Exogenous Changes: The Joint Effect of Network Heterogeneity and Culture of Innovation. Article. *International Journal of Innovation Management*. May 2019;23(4)doi:10.1142/S1363919619500300

17. Fincham J. Response rates and responsiveness for surveys, standards, and the Journal. . *American journal of pharmaceutical education*. 2008;72(2)

18. Weng R-H, Huang C-Y, Chen L-M, Chang L-Y. Exploring the impact of transformational leadership on nurse innovation behaviour: a cross-sectional study. *Journal of nursing management*. 2015;23(4):427-39. doi:https://dx.doi.org/10.1111/jonm.12149

19. Kim SJ, Park M. Leadership, Knowledge Sharing, and Creativity The Key Factors in Nurses' Innovative Behaviors. Article. *Journal of Nursing Administration*. Dec 2015;45(12):615-621. doi:10.1097/NNA.0000000000000274

20. Nieboer AP, Strating MMH. Innovative culture in long-term care settings: the influence of organizational characteristics. *Health care management review*. 2012;37(2):165-74. doi:https://dx.doi.org/10.1097/HMR.0b013e318222416b

21. Muñoz-van den Eynde A, Cornejo-Cañamares M, Diaz-Garcia I, Muñoz E. Measuring innovation culture: development and validation of a multidimensional questionnaire. *Advances in Research*. 2015:122-141.

22. Mesfin D, Woldie M, Adamu A, Bekele F. Perceived organizational culture and its relationship with job satisfaction in primary hospitals of Jimma zone and Jimma town administration, correlational study. *BMC health services research*. 2020;20(1):438. doi:https://dx.doi.org/10.1186/s12913-020-05319-x

23. Acar AZ, Acar P. The effects of organizational culture and innovativeness on business performance in healthcare industry. *8th International Strategic Management Conference*. Elsevier Science Bv; 2012:683-692. *Procedia Social and Behavioral Sciences*.

24. Liebe J-D, Esdar M, Thye J, Hubner U. Antecedents of CIOs' Innovation Capability in Hospitals: Results of an Empirical Study. *Studies in health technology and informatics*. 2017;243:142-146.

25. Proudfoot J, Jayasinghe UW, Holton C, et al. Team climate for innovation: what difference does it make in general practice? *International journal for quality in health care : journal of the International Society for Quality in Health Care*. 2007;19(3):164-9.

26. Anderson NR, West MA. Measuring climate for work group innovation: development and validation of the team climate inventory. Article. *Journal of Organizational*

Behavior. May 1998;19(3):235-258. doi:10.1002/(SICI)1099-1379(199805)19:3<235::AID-JOB837>3.3.CO;2-3

27. Scott S, Bruce R. Determinants of innovative behavior: A path model of individual innovation in the workplace. . *Academy of management journal*. 1994;37(3):580-607.

28. Caldwell DF, O'Reilly CA. The determinants of team-based innovation in organizations: The role of social influence. . *Small Group Research*. 2003;34(4)

29. Phung V-H, Essam N, Asghar Z, Spaight A, Siriwardena AN. Exploration of contextual factors in a successful quality improvement collaborative in English ambulance services: cross-sectional survey. *Journal of evaluation in clinical practice*. 2016;22(1):77-85. doi:https://dx.doi.org/10.1111/jep.12438

30. Liu F-C, Cheng K-L, Chao M, Tseng H-M. Team innovation climate and knowledge sharing among healthcare managers: mediating effects of altruistic intentions. *Chang Gung medical journal*. 2012;35(5):408-19.

31. Yan D, Wen F, Li X, Zhang Y. The relationship between psychological capital and innovation behaviour in Chinese nurses. *Journal of nursing management*. 2020;28(3):471-479. doi:https://dx.doi.org/10.1111/jonm.12926

32. Rashid A, Nawaz S, Zaman U. Examining the effect of inclusive climate on public health official's creative performance: Mediating role of innovation climate. Article; Early Access. *Journal of Public Affairs*. 2020;doi:10.1002/pa.2273

33. Dackert I. The impact of team climate for innovation on well-being and stress in elderly care. *Journal of nursing management*. 2010;18(3):302-10. doi:https://dx.doi.org/10.1111/j.1365-2834.2010.01079.x

34. Roen I, Kirkevold O, Testad I, Selbaek G, Engedal K, Bergh S. Person-centered care in Norwegian nursing homes and its relation to organizational factors and staff characteristics: a cross-sectional survey. *International psychogeriatrics*. 2018;30(9):1279-1290. doi:https://dx.doi.org/10.1017/S1041610217002708

35. Lansisalmi H, Kivimaki M. Factors associated with innovative climate: What is the role of stress? Article. *Stress Medicine*. Oct 1999;15(4):203-213. doi:10.1002/(SICI)1099-1700(199910)15:4<203::AID-SMI816>3.0.CO;2-B

36. King EB, De Chermont K, West M, Dawson JF, Hebl MR. How innovation can alleviate negative consequences of demanding work contexts: The influence of climate for innovation on organizational outcomes. Article. *Journal of Occupational and Organizational Psychology*. Dec 2007;80:631-645. doi:10.1348/096317906X171145

37. Weng RH, Huang CY, Huang JA, Wang MH. The cross-level impact of patient safety climate on nursing innovation: a cross-sectional questionnaire survey. Article. *Journal of Clinical Nursing*. Aug 2012;21(15-16):2262-2274. doi:10.1111/j.1365-2702.2012.04170.x

38. Sonmez B, Yildirim A. The mediating role of autonomy in the effect of pro-innovation climate and supervisor supportiveness on innovative behavior of nurses. Article; Proceedings Paper. *European Journal of Innovation Management*. Jan 2019;22(1):41-58. doi:10.1108/EJIM-05-2018-0088

39. West MA, Wallace M. Innovation in health care teams. *European Journal of Social Psychology*. 1991;21(4):303-315. doi:http://dx.doi.org/10.1002/ejsp.2420210404

40. Isaksen S, Lauer K, Ekvall G. Situational outlook questionnaire: A measure of the climate for creativity and change. . *Psychological reports*. 1999;85(2):665-74.

41. Quinn RE, Spreitzer GM. The psychometrics of the competing values culture instrument and an analysis of the impact of organizational culture on quality of life. *Research in Organizational Change and Development* 1991;5:15–42.

42. Wang CL, Ahmed PK. The development and validation of the organisational innovativeness construct using confirmatory factor analysis. . *European Journal of Innovation Management*. 2004;7(4):303-313.

43. Anderson N WM. The Team Climate Inventory: Development of the TCI and its applications in teambuilding for innovativeness. . *European Journal of work and organizational psychology*. 1996;5(1)

44. Agency NM. *Improvement Leaders' Guide: Building and Nurturing an Improvement Culture.* 2005.

45. Siegel S, Kaemmerer W. Measuring the perceived support for innovation in organizations. . *Journal of Applied Psychology* 1978;63(5):553.

46. West MA. The social psychology of innovation in groups. 1990;

47. Patterson M. *Development and validation of an organizational climate measure*. 2004.

48. Siegel SM, Kaemmerer WF. Measuring the perceived support for innovation in organizations. *Journal of Applied Psychology*. 1978;63(5):553.

49. Agency NM. *Improvement Leaders' Guide: Building and Nurturing an Improvement Culture*. 2005.

50. Chan YH, Taylor RR, Markham S. The role of subordinates' trust in a social exchange-driven psychological empowerment process. *Journal of Managerial Issues*. 2008;20(4):444-467.

51. Hulscher ME, Schouten LM, Grol RP, Buchan H. Determinants of success of quality improvement collaboratives: what does the literature show? *BMJ Qual Saf*. Jan 2013;22(1):19-31. doi:10.1136/bmjqs-2011-000651

52. Hallberg IR, Hansson UW, Axelsson K. Satisfaction with nursing care and work during a year of clinical supervision and individualized care. Comparison between two wards for the care of severely demented patients. *J Nurs Manag*. Nov 1993;1(6):297-307. doi:10.1111/j.1365-2834.1993.tb00231.x

53. Carnevali D, Patrick M. *Nursing Management for the Elderly, 2th edn.* . JB Lippincott Company; 1986.

54. Ahmed PK. Culture and climate for innovation. *European Journal of Innovation Management*. 1998;1(1):30-43.

55. Schein EH. *Organizational Culture and Leadership (Vol. 2)*. John Wiley & Sons.; 2010.

56. Amabile TM, Conti R, Coon H, Lazenby J, M. H. Assessing the work environment for creativity. *Academy of management journal*. 1996;39(5):1154-84.

57. Brunelle J, Frisk D, Benjamin M, Randall P, Sheikh A. *Measuring the Impact Of Innovation Activities in Government*. 2019.

58. Ekvall G. Organizational climate for creativity and innovation. . *European Journal of Work & Organizational Psychology*. 1996;5(1):105.

59. Tseng YF, Lee TZ. Comparing appropriate decision support of human resource practices on organizational performance with DEA/AHP model. . *Expert Systems with Applications*. 2009;36:6548–6558.

60. Kleysen R, Street C. Toward a multi-dimensional measure of individual innovative behavior. *J Intell Cap*. 2001;2(3):284-296. .

61. Esdar M, Liebe J, Weiß J, Hübner U. Exploring Innovation Capabilities of Hospital CIOs: An Empirical Assessment. . *Stud Health Technol Inform*. 2017;235:383-387.

62. O'Reilly CA, Chatman J, Caldwell DF. People and organizational culture: A profile comparison approach to assessing person-organization fit. *Acad Manag J*. 1991;34:487–516.

63. Kwon J. The influence of innovative organization culture to human resource innovation and organizational commitment. *J Bus Res* 2011;23(1):153-182.

64. Kim N, Lee J. Empirical study on organizational culture types, CEO leadership styles, and behavioral performance. . *Korean J Manage* 1997;5(1):193-238.

65. Dallner A, Elo A-L, Gambrele F, et al. Validation of the General Nordic Questionnaire for Psychological and Social Factors at Work. *Nordic Council of Ministers Copenhagen, DK Nord*. 2000;

66. Qian Y, Zhang Y-Q, Wu J-M, Wang H-C. Development and psychometric test of Nurse Organizational Innovation Climate Scale. *Chinese Journal of Nursing*. 2016;51(2):243–247.

67. Phillips W. *The Organizational Health Survey.* 1988:141±160. *The 1988 Annual: Developing Human Resources*.

68. Jansen JJP, Van Den Bosch FAJ, Volberda HW. Exploratory innovation, exploitative innovation, and performance: Effects of organizational antecedents and environmental moderators. . *Management Science*. 2006;52(11):1661-1674.

69. Burningham C, West MA. Individual, climate, and group interaction processes as predictions of work team innovation. . *Small Group Research*. 1995;26

70. Cameron K, Quinn R. *Diagnosing and changing organizational culture: Based on the competing values framework.* 2011.

APPENDIX A. SEARCH STRATEGIES

DATABASE SEARCHED & TIME PERIOD COVERED:
Web of Science – inception – 9/18/2020
237 results

Search Strategy

TS=((("culture of innovation" OR "culture of creativity" OR (((innovat* or creativ*) NEAR/2 (culture* OR climate*))

AND

(management OR organization OR staff OR personnel OR employ*))) AND (health* OR hospital* OR medical)))

DATABASE SEARCHED & TIME PERIOD COVERED:
OVID MEDLINE – Inception – 9/18/2020
183 results

Search Strategy

("culture of innovation" OR "culture of creativity" OR (((innovat* or creativ*) adj2 (culture* OR climate*))

AND

(management OR organization OR staff OR personnel OR employ*))).ti,ab

DATABASE SEARCHED & TIME PERIOD COVERED:
PsycINFO – inception to 9/18/2020
155 results

Search Strategy

("culture of innovation" OR "culture of creativity" OR (((innovat* or creativ*) NEAR/2 (culture* OR climate*))

AND

(management OR organization OR staff OR personnel OR employ*))) AND (health* OR hospital* OR medical)

APPENDIX B. PEER REVIEWER COMMENTS AND RESPONSES

Comment	Response
The objectives of the research, and how the research might be translated into practice, could use additional detail in the report.	We have revised the report to incorporate additional details regarding objectives and translation into practice.
I feel there is a need for a little more precision, in the language throughout the report, to remind the reader when the review is focused exclusively on innovation culture as defined and cultivated within a healthcare setting, and when it looks/draws conclusions relevant beyond that setting. Innovation is a topic of enormous interest in economics, management, etc., and reviewing all of that literature would be well beyond the scope of this review, and would not necessarily yield more useful result for a health care audience. However it would be good to be more consistent in being clear about this throughout the review. Some of the more striking examples: - Key Question 1 could refer to "the literature within medical and/or health services research" not just "the literature; - "Key Questions 2 and 3 similarly need their scope more explicitly defined; - in Appendix A, I read these search strategies as including both strategies requiring "health" or "medical" or "hospital" and strategies that did not (but within Medline). It surprises me that only 480 potential articles were identified if the search criteria did not always include a need for a healthcare setting (maybe that has to do with what Medline indexes). A line or 2 clarifying what academic fields/disciplines were most likely to not be captured would be helpful;	We have added appropriate wording to make clear that our focus is a healthcare setting throughout the report and revised all 3 key questions to be more specific in this regard. We would agree that innovation is a topic of enormous interest in economics, management, etc., and reviewing all of that literature would be well beyond the scope of this review, which was focused specifically on culture rather than innovation more broadly. We have added the number of citations to each of the searches in Appendix A. We chose databases intending to capture all relevant academic fields/disciplines, so we are unable to comment on what we may have potentially missed with our strategy, as we would have incorporated these missed areas if they were known to us.
- Emphasizing somehow which measures were developed (or validated) in a healthcare setting, and which originated in other fields, would be of interest.	For a few of the measures identified in more than 1 included study, we have added information about whether measures were developed or validated in a healthcare setting. However, it is beyond the scope of this review to identify and describe all research contributing to the development

	and validation of the specific measures we identified in the course of our review. While in some instances the literature we identified had described the measure, its development and/or validation process, this was often not the case, and would require additional search and literature synthesis.
The search terms described in Appendix A (Page 27), focusing on "culture of innovation" and related terms, may have missed a portion of the large body of research on "organizational innovation," which is similarly relevant to the topic at hand but may not use identical terminology. It looks like the exact search terms may have caught many of those articles, but it is difficult to know for certain.	The literature captured with the term “organizational innovation” was very broad, and often described innovation outside of an organization’s culture, which was the focus of this report. As such, this was too broad a term for our search strategy.
Executive Summary Introduction—I think you need to add a sentence or phrase indicating why a culture of innovation is valuable. Data abstraction and quality assessment—The second paragraph, and particularly the first sentence, is unclear. What do you mean by the culture of innovation doesn’t have instruments to assess the quality of studies? Results KQ1—This results summary doesn’t really answer the question, how is culture of innovation defined. Could you instead summarize the findings themselves? KQ2—Similarly, rather than counts about where the metrics come from, can you describe the metrics? KQ3—This summary also does not describe the key characteristics and outcomes of the programs. Can you instead describe what the programs did and what outcomes they achieved? If the studies were not sufficiently rigorous to warrant reporting their findings, you could say that instead. Discussion—Just noting that this section is quite a bit longer and more detailed than the other sections of the executive summary, so feels somewhat inconsistent. Perhaps you could find a middle ground. I do think some of the previous sections could use more detail.	We have revised the executive summary to incorporate suggested changes.(pg 6-8) In regards to comment about KQ3, while there were some signals of positive culture of innovation outcomes as indicated by the programs identified in the review, the low level of certainty of evidence due to the very low response rates and/or small sample sizes from the studies limited our ability to draw conclusions.

p.10 line 14. I think it would help to acknowledge that there are multiple facets of organizational culture (*eg*, safety culture, innovation culture) and that scholarship has increasingly acknowledged the value of focusing on specific types. This seems like a missing link between organizational culture overall and innovation culture in particular. p.10 line 17. This paragraph needs to do a better job of setting up the questions, particularly KQ1. In other words, if INPOWR defined a culture of innovation as having 4 dimensions, and that is satisfactory, then why are you asking how culture of innovation is defined? Presumably, you were interested in how others defined culture of innovation and how other definitions related to the INPOWR model.	We have revised the introduction to acknowledge that there are multiple facets of organizational culture and that scholarship has increasingly acknowledged the value of focusing on specific types. We have also revised this section to do a better job of setting up the 3 key questions. (p.9)
p.11 line 26. Search strategy. In your search of culture of innovation and culture of creativity, did related terms arise? If so, it would be worth describing how you dealt with this situation. For example, once noted, did you pursue the related terms? About how often did it happen? You can leave what terms emerged for the results. p.12 line 10. Quality assessment. I'm still struggling with this. I can understand saying that a quality assessment was beyond the intended scope of this review, but I'm a little doubtful that it wouldn't be possible to assess the quality of studies you identified. Even if specific instruments for assessing quality of studies about culture of innovation are not available, if the team wanted to assess study quality, could you not have borrowed more generic evaluation criteria?	This area is extremely nebulous and as such, we decided to stick to a narrower scope for our searches in accordance to the intended use of this report. For example, there is definite overlap between culture of innovation and organizational learning and patient safety culture. However, organizational learning and patient safety culture would each require an entire review. We have described this challenge in research gaps and future research section. (p.28) We struggled with finding an appropriate quality assessment tool for our included studies. After consulting with some methodological experts, they agreed with our approach given the challenges of this report's scope. Typically, quality assessments are used to describe the risk of bias for outcomes from the evaluation of an intervention. As the majority of our studies did not include interventions, this would not help describe the body of literature we identified overall, nor would it help readers interpret key questions 1 or two. We were not able to identify an existing assessment or determine a set of criteria that would be suitable to assess quality for studies defining culture of innovation or using a

	metric, as is the focus of these 2 questions. While there are quality assessment criteria for the development of a metric, not all our included studies described this process, and applying these criteria to studies with a different set of aims would not be appropriate. For the subset of intervention studies, we do describe the major risks of bias and their considerable impact on the interpretation of the studies, but we do so qualitatively rather than assigning quality assessment scores, since there are only 4 studies to describe and their issues with small sample size and/or low response rates make any other risk of bias of secondary concern.
Figure 1: Suggest you revise "Program" to read "Program and metrics"	We have added "program and" to Figure 1. (p.12)
p.16 line 12. If Anderson and West turned out to be the framework linking most of the studies, why do you introduce this ESP report by focusing on INPOWR? Alternatively, since you began by introducing the INPOWR framework, could you at least comment on its relevance in the literature you reviewed?	We have revised the introduction to better link to the contents of our results.
p.17 KQ2. This section left me wondering what was in these metrics and how they compared? Can you say something about which or under what conditions different metrics seemed more valuable?	Because of many single-use or adaptations, it is hard to distinguish a pattern among metrics identified from included studies. In addition, while some instruments were available in the included study, most were not. In order to further explore the content of these metrics we would have had to conduct a comprehensive qualitative content analysis which proved to be out of scope for this project. We are considering this as a future extension of our current work if time permits.

p.19 line 25. Can you explain what the UK intervention meant by leadership learning? If that is the intent of the Figure on Leadership Learning Programs, you should make that clear. P.20 line 40. What is a clinical supervision intervention? Again, refer to the figure if needed.	We have added figure headings and referred to them in-text. (p.22-23)
p.21 line 24. I think it would be helpful to list the Anderson and West dimensions. p.21 line 35. It would also be helpful to describe the Team Climate Inventory in more detail. p.21 line 45. You could summarize by saying that interventions so far have emphasized x, y, z.	We have listed the Anderson and West dimensions, described the Team Climate Inventory in more detail, and added more information about interventions. (p.25-26)
Publication Bias section has some grammatical and spelling errors and needs additional copy editing (Page 22).	We have revised the publication bias section. We have also added a relevance to VA subsection. (p.27)
Additional information on potentially generalizable findings from the 4 key studies reviewed would strengthen the Discussion section, as would information on how interventions and measures listed might be adapted and implemented in the specific context of the VHA system. This might be structured as a new subsection.	We have revised KQ3 and added details about the interventions. However, the low level of certainty of evidence due to very low response rate and/or small sample size reported in the intervention studies limited our ability to provide generalizable findings.
Figure 3 - the wordcloud - is not particularly helpful, especially since the /most common words are "innovation" and "innovative". It might be interesting to see how such a word cloud compares to 1 generated by searching management literature outside of health care, but that is beyond the scope of this review.	While authors agree comparing to a broader literature would of great interest, we also agree this is beyond the scope of this review.
Although excluded from the evidence reviewed, the 5 articles excluded for being commentary only might be useful to review and comment on in the Discussion, as part of describing future areas of research.	We agree that reviewing commentaries might be useful for identifying future areas of research. However, there were a total of 78 publications excluded for being editorials/commentary. Reviewing these 78 publications to identify future areas of research would be out of scope for this review.

Reading this report, I was struck by how much overlap there is between research on fostering leadership and research on fostering innovation (the UK study, where a leadership training program used innovation climate as an outcome, is a strong example of this). Do some concepts of innovation rely more on innovation from "above" by people in formal leadership positions, and do other concepts/approaches to innovation rely more on distributed leadership/initiative from "below?" This is beyond the scope of the key questions but strikes me as an interesting question for future research.	We agree that this is an interesting question for future research and have noted this in the discussion section.
It is unfortunate but not surprising there is not a larger evidence base of studies describing interventions within healthcare to foster innovation. The report has summarized well what exists, and gathering in 1 report all the different definitions and tools used to try to capture innovation climate may prove useful for others wanting to know where the state of the evidence and practice stands.	Thank you for the comment.
p4, 5-7: titles should be capitalized, *ie*, Director of Operations... Director of Programming; p4, 22: omission -"...Myers and the..." p4, 42: omission- Discovery, Education and Affiliate Networks	We have made the suggested changes. (p.iii)

APPENDIX C. DATA ABSTRACTION FORM

1. Sample size, units (rr)

2. Location

3. Is there an intervention that demonstrates a change in culture of innovation as an outcome?
   - No intervention
   - Yes (name intervention/program)
   - Unclear

4. Metric Characteristics (must include at least 1 measure of culture of innovation, otherwise say none)
   - None
   - Yes (name, or characteristics/traits identified/measured, number of items/scales, include citation)
   - Unclear

5. Data Analysis
   - Descriptives
   - Validation
   - Mediation (SEM)/path analysis
   - Regression analysis
   - Other

6. Study design
   - Cross-sectional
   - RCT
   - Pre-post
   - Time-series/repeated surveys
   - Interview/Focus group
   - Other

7. Findings from abstract

APPENDIX D. DEFINITIONS TABLE

Author, year	In-text Definition	Citation
Nowak 2019[16]	…**culture of innovation** that is defined in this paper as a culture that mandates employee engagement and support for the process of organisational change (*eg*, Anderson and West, 1998; Scott and Bruce, 1994). Prior literature has also investigated the role of organisational culture within context of the process of internal change, proposing that a firm's cultural norms may dictate employee engagement in innovative behaviours by creating a strong expectation that employees must engage in such behaviours as information sharing, feedback providing, collaborative-problem solving, and generating and supporting new process improvement ideas (*eg*, Zahra et al., 2004; West and Anderson, 1996; Scott and Bruce, 1994). According to West and Anderson (1996), this culture generates "the expectation, approval, and practical support of attempts to introduce new and improved ways of doing things in the work environment" (West and Anderson, 1996, p. 686).	Anderson, NR and MA West (1998). Measuring climate for work group innovation: development and validation of the team climate inventory. Journal of Organizational Behavior: The International Journal of Industrial, Occupational and Organizational Psychology and Behavior, 19(3), 235–258. Scott, SG and RA Bruce (1994). Determinants of innovative behavior: A path model of individual innovation in the workplace. Academy of Management Journal, 37(3), 580–607. West, MA and NR Anderson (1996). Innovation in top management teams. Journal of Applied Psychology, 81(6), 680. Zahra, SA, JC Hayton and C Salvato (2004). Entrepreneurship in family vs. non-family firms: A resource-based analysis of the effect of organizational culture. Entrepreneurship Theory & Practice,28(4),363-381.
Phung 2016[29]	Box 3 [Seven dimensions measuring **organizational culture of innovation**]: Risk taking; Resources for innovation; Widely shared knowledge; Specific targets; Tools and techniques; Reward systems; Rapidly formed relationships	25. Great Britain.NHS Modernisation Agency (2005) Improvement Leaders' Guide: Building and Nurturing an Improvement Culture. London: Department of Health.
Apekey 2011[15]	For improvement to occur, organizations require effective leadership, a culture supporting innovation, the assimilation of technical skills and structures for coordinating and monitoring change [7]. Culture is a 'shared set of (implicit and explicit) values, ideas, concepts, and rules of behaviour that allow a social group tofunction and perpetuate itself.' [8] Cultural resistance is thought to arise from a lack of vision, poor organization, teamwork or attitudes and deficient learning [9]. The culture for improvement within practices was evaluated using an instrument designed by the NHS Institute for Innovation and Improvement [22] where respondents rated their organization's current **culture for innovation** using 7 dimensions on a 'Spider Diagram' (Fig. 1), an instrument measuring the degree to which there were resources, support and rewards for innovation within practices (Box 1[Dimensions of	7. Huntington, J., Gillam, S. & Rosen, R. (2000) Clinical governance in primary care: organisational development for clinical governance. *BMJ*, 321, 679–682. 8. Hudelson, P. M. (2004) Culture and quality: an anthropological perspective. *International Journal for Quality in Health Care*, 16, 345–346. 9. Stevenson, K. & Baker, R. (2009) Investigating organisational culture in primary care. *Quality in Primary Care*, 13, 191–200. 22. Great Britain. NHS Modernisation Agency (2005) Improvement Leaders' Guide: Building and

Author, year	In-text Definition	Citation
	organizational culture for innovation]): Risk; Resources; Information; Targets; Tools; Reward; Relationships	Nurturing an Improvement Culture. London: Department of Health.
Liebe 2017[24]	Chief information officers (CIOs) stand at the heart of corresponding management activities [4]. Their perceived ability to initialise, implement and institutionalise new and suitable HIT solutions can be defined as **innovation capability** [5], a construct composed of latent personal and organizational characteristics. These are in detail: an **innovative organisational culture** and the CIOs' intrapreneurial personality and openness towards users [6]. Innovative organizational culture describes a working environment that nurtures unorthodox thinking, which is based on shared values, basic underlying assumptions and observable artifacts [7, 8]…With regard to HIT, innovative organisational culture can be characterised by shared visions about the future role of HIT, by a supportive hospital board (HB) and by a certain degree of flexibility in organisational structures, processes and work routines [3,6].	[3] Cresswell K, Sheikh A. Organizational issues in the implementation and adoption of health information technology innovations: an interpretative review. Int journal of medical informatics 2013; 82:e73-e86. [4] Haux R, Winter A, Ammenwerth E, Brigl B. How to Strategically Manage Hospital Information Systems. In: Strategic Information Management in Hospitals. Springer; 2004. pp. 177-220. [5] Avgar AC, Litwin AS, Pronovost PJ. Drivers and barriers in health IT adoption: a proposed framework. Applied clinical informatics 2012; 3:488-500. [6] Esdar M, Liebe JD, Weiß JP, Hübner U. Exploring Innovation Capabilities of Hospital CIOs: An Empirical Assessment. Stud Hlth Technol Inform. 2017;235:383-387. [7] Schein E, H. Organizational culture. American Psychologist 1990; 45:109–119. [8] Khazanchi S, Lewis MW, Boyer KK. Innovation-supportive culture: The impact of organizational values on process innovation. Journal of Operations Management 2007; 25:871-884.
Buschgen 2013[3]	Those make up a range from broad variables such as **innovation culture** (*eg*, Chandler, Keller, and Lyon, 2000; Gumusluoglu, and Ilsev, 2009) or supportive culture (*eg*, Abbey and Dickson, 1983; Berson, Oreg, and Dvir, 2008; Wei and Morgan, 2004) to very specific cultural variables like tolerance for failure (Danneels, 2008) or participative decision-making (Hurley and Hult, 1998).	Chandler, G. N., C. Keller, and D. W. Lyon. 2000. Unraveling the determinants and consequences of an innovation-supportive organizational culture. Entrepreneurship Theory and Practice(Fall): 59–76. Gumusluoglu, L., and A. Ilsev. 2009. Transformational leadership and organizational innovation: The roles of internal and external support for innovation. Journal of Product Innovation Management26: 264–77. Abbey, A., and J. W. Dickson. 1983. R&D work climate and innovation in semiconductors. Academy of Management Journal26 (2): 362–68.

Author, year	In-text Definition	Citation
		Berson, Y., S. Oreg, and T. Dvir. 2008. CEO values, organizational culture and firm outcomes. Journal of Organizational Behavior29: 615–33. Wei, Y., and N. A. Morgan. 2004. Supportiveness of organizational climate, market orientation, and new product performance in Chinese firms. Journal of Product Innovation Management21: 375–88. Danneels, E. 2008. Organizational antecedents of second-order competences. Strategic Management Journal. 29: 519–43.a Hurley, R. F., and G. T. M. Hult. 1998. Innovation, market orientation, and organizational learning: An integration and empirical examination. Journal of Marketing.62:42-54.
Cramm 2013[8]	**Innovative cultures** reportedly enhance the creation and implementation of new ideas and working methods in organizations (Caldwell & O'Reilly, 2003). Innovative cultures reflect attitudes and behaviors of teams as well as the organization and are known to provide a link between effective organizational practice and high-quality healthcare (Mickan & Rodger, 2000; St. John Burch & Anderson, 2003).	Caldwell, D. F., & O'Reilly, C. A. (2003). The determinants of team-based innovation in organisations. The role of social influence. Small Group Research, 34, 497e517. Mickan, S., & Rodger, S. (2000). Characteristics of effective teams: a literature review. Australian Health Review, 23, 201e208 St. John Burch, G., & Anderson, N. (2003). What does it take to be a good team player? Assessing team climate preference can help. Select Development Review,19,15-19.
Muñoz-van den Eynde 2015[21]	the STI Outlook 2012 [3] pointed out that it is increasingly recognized that innovation is influenced by certain social and cultural values, norms, attitudes and behaviors which may be described as **innovation culture**. In this paper we focus on 3 issues directly related to measuring innovation culture. First, the lack of validated measurement scales of innovation culture [2], necessary to enhance the understanding of innovation culture. Second, the difficulty in identifying the factors determining the tendency and ability of organizations to produce innovations [4], key for diagnostic purposes. Third, the excessive focus on organizations, neglecting the relevance of social factors and individuals. Innovation and culture are social constructs [6]. To say that something is socially constructed is to emphasize its dependence on society.	2. Dobni CB. Measuring innovation culture in organizations. The development of a generalized innovation culture construct using exploratory factor analysis. Eur. J. Innov. Manag. 2008;11(4):539-59. 3. Organisation for Economic Co-operation and Development. OECD Science, Technology and Industry Outlook 2012. Paris: OECD; 2012. 4. Wang CL, Ahmed PK. The development and validation of the organizational innovativeness construct using confirmatory factor analysis. Eur. J. Innov. Manag. 2004;7(4):303:13. 6. Cornejo M, Muñoz E. Percepción de la innovación: cultura de la innovación y capacidad

Author, year	In-text Definition	Citation
	The social context tends to be ignored when measuring innovation culture. Addressing this issue, it seems appropriate to talk about the social appropriation of innovation, a term from Science, Technology and Society (STS) studies. If this approach is to be accepted, it is necessary to include not only cognitive and economic elements in the concept of innovation, but also social, organizational and cultural aspects. Ultimately, all innovations generate changes due to their adoption or rejection by society [10]. We consider it fundamental to know workers' perceptions about the influence of this dimension on their ability to do their job. An organization's innovative capability depends, at least partly, on the innovative traits of its employees [2,11]. Thus, individual differences have to be taken into consideration [16-18]. Another relevant and neglected factor is trust. Trust may be broken down into 2 dimensions: trust among employees, and trust between personnel and leaders [19]. Therefore, it is also important to know which traits in workmates and leaders are valued by employees.	innovadora. In: Pérez Sedeño E., Cimoli M, coordinators. Innovación y Conocimiento. Pensamiento Iberoamericano. 2012;5:2ª.n época. Spanish. 10. Rogers EM. Diffusion of innovations. 5th ed. New York: Free Press; 2003. 11. Tang HK. An inventory of organizational innovativeness. Technovation. 1999;19: 41-51. 16. Dewett T. Employee creativity and the role of risk. Eur. J. Innov. Manag. 2004;7(4): 257-266. 17. Williams SD. Personality, attitude and leader influences on divergent thinking and creativity in organizations. Eur. J. Innov. Manag. 2004;7(3):187-204. 18. McLean LD. Organizational culture's influence on creativity and innovation: A review of the literature and implications for human resource development. Adv. Dev. Hum. Resour. 2005;7(2):226-246. 19. Ellonen R, Blomqvist K, Puumalainen K. The role of trust in organizational innovativeness. Eur. J. Innov. Manag. 2008;11(2):160-181.
Nieboer 2012[20]	**Innovative cultures** are known to provide a link between efficient organizational practice and high-quality patient care (Anderson & West, 1998; Mickan & Rodger, 2000; St. John Burch & Anderson, 2003). Innovative culture, conceptualized as group norms that exert control over attitudes and behavior by representing what ''is'' or ''ought to be'' in a particular situation may be more or less conducive to creativity, risk taking, and tolerating mistakes and facilitate implementation by generating social approval when working together effectively and acting quickly (Caldwell & O'Reilly, 2003). Such innovative cultures have been reported to enhance the creation and implementation of new ideas and working methods in organizations (Ferlie & Shortell, 2001; Leggat et al., 1998). Innovation in service delivery and organizations can be defined as a novel set of behaviors, routines, and work methods that improve health outcomes, administrative efficiency, cost effectiveness, or user experience implemented by planned and coordinated actions (Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004).	Avolio, B. J., & Bass, B. M. (1999). Re-examining the components of transformational and transactional leadership using the multifactor leadership. Journal of Occupational and Organizational Psychology, 72(4), 441Y462. Anderson, N. R., & West, M. A. (1998). Measuring climate for work group innovation: Development and validation of the team climate inventory. Journal of Organizational Behavior, 19(3), 235Y258. Mickan, S., & Rodger, S. (2000). Characteristics of effective teams: A literature review. Australian Health Review, 23(3), 201Y208. St. John Burch, G., & Anderson, N. (2003). What does it take to be a good team player? Assessing team climate preference can help. Selection and Development Review, 19, 15Y19.

Author, year	In-text Definition	Citation
	Champagne, Denis, Pineault, and Contandriopoulos (1991) and Ferlie and Shortell (2001) have shown that several organizational factors affect an organization's ability to innovate services. Different organizations provide different contexts for innovation, and some organizational features have been shown to influence the likelihood that an innovation will be successfully assimilated (Greenhalgh et al., 2004). According to Greenhalgh et al. (2004), leadership styles influence the development of an innovative culture. Den Hartog, Van Muijen, and Koopman (1997) have reported on 3 different management styles: transformational, transactional, and passive. Transactional leaders build expectations by setting specific performance targets with their employees (Avolio & Bass, 1999), significant here because West et al. (2003) have shown that leadership clarity predicts team innovation in health care. Transformational leaders upset the status quo and existing rule structures, replacing them with a ''new order'' and way of doing things (Ferlie & Shortell, 2001). Passive leaders tend to react only after problems have become serious enough to take corrective action and often avoid making decisions at all (Avolio & Bass, 1999). Transactional and transformational leadership styles are thus expected to be positively related to innovative culture, whereas a passive leadership style is negatively related to innovative culture.	Caldwell, D. F., & O'Reilly, C. A. (2003). The determinants of team-based innovation in organizations: The role of social influence. Small Group Research, 34(4), 497Y517. Ferlie, E. B., & Shortell, S. M. (2001). Improving the quality of health care in the United Kingdom and the United States: A framework for change. Milbank Quarterly, 79(2), 281Y315. Leggat, S. G., Narine, L., Lemieux-Charles, L., Barnsley, J., Baker, G. R., Sicotte, C., I Bilodeau, H. (1998). A review of organizational performance assessment in health care. Health Services Management Research, 11(1), 3Y18; discussion 19Y23. Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P., & Kyriakidou, O. (2004). Diffusion of innovations in service organizations: Systematic review and recommendations. Milbank Quarterly, 82(4), 581Y629. Champagne, F., Denis, J. L., Pineault, R., & Contandriopoulos, A. P. (1991). Structural and political models of analysis of the introduction of an innovation in organizations: The case of the change in the method of payment of physicians in long-term care hospitals. Health Services Management Research, 4(2), 94Y111. Den Hartog, D. N., Van Muijen, J. J., & Koopman, P. L. (1997). Transactional versus transformational leadership: An analysis of the MLQ. Journal of Occupational and Organizational Psychology, 70(1), 19Y34.
Lansisalmi 1999[35]	Research on the determinants of an **innovative climate** has concentrated on factors that can be traced back to the classic motivation and organizational behaviour theories, such as goal setting-theory6 and the job characteristics model,7 and 2 management systems based on these theories, total quality management and management by	6. Locke, E. A. and Latham, G. P. A Theory of Goal Setting and Task Performance. Prentice Hall, Englewood-Cliffs, NJ, 1990. 7. Hackman, J. R. and Oldham, G. Work Redesign. Addison-Wesley, Reading, MA, 1980.

Author, year	In-text Definition	Citation
	objectives.8-17 On this basis, the role of various correlates of innovative climate, including goal clarity, feedback, communication processes and autonomy, has been explored.	8. Barnard, C. I. Organization and Management. Harvard University Press, Cambridge, 1938. 9. Drucker, P. F. The Practice of Management. Harper, New York, 1954. 10. Drucker, P. F. What results should you expect? A user's guide to MBO. Pub. Admin. Rev. 1976; 36: 12-19. 11. Drucker, P. F. Innovation and Entrepreneurship: Practice and Principles. Heinemann, London, 1985. 12. Crosby, P. Quality is Free. McGraw-Hill, Washington, DC, 1979. 13. Juran, J. M. Management of Quality. McGraw-Hill, Washington, DC, 1981. 14. Deming, W. E. Out of the Crisis: Quality, Productivity and Competitive Position. Cambridge University Press, Cambridge, 1982. 15. Ishikawa, K. What is Total Quality Control. Prentice Hall, Englewood Cli€s, NJ, 1985. 16. Garvin, D. A. Managing Quality. Free Press, New York, 1988. 17. Poister, T. H. and Streib, G. Management tools in government: Trends over the past decade. Pub. Admin. Rev. 1989; 49: 240-248.
Roen 2018[34]	**Innovative climate** construct is mentioned as a domain of the instrument; not explicitly mentioned or defined by authors	Dallner, M., Elo, A.-L., Gamberale, F., Hottinen, V., Knardahl, S. and Lindström, K. (2000). *Validation of the General Nordic Questionnaire (QPSNordic) for Psychological and Social Factors at Work.* Copenhagen: Nordic Council of Ministers, Nord.
Yan 2020[31]	Researchers have explored the influence of perceived organizational climate on innovation behaviour, and almost all results support **perceived organisational innovation climate** as a positive factor in innovation behaviour. Isaksen and Akkermans (2011) mentioned that perceived organisational innovation climate can provide a cognitive foundation for innovation and support the actions to implement innovation. Besides, positive PsyCap can also promote the perceived of the organisational innovation climate.	Qian, Y., Zhang, Y.-Q., Wu, J.-M., & Wang, H.-C. (2016). Development and psychometric test of Nurse Organizational Innovation Climate Scale. *Chinese Journal of Nursing*, *51*(02), 243–247. Isaksen, S. G., & Akkermans, H. J. (2011). Creative climate: A leadership lever for innovation. *The Journal of Creative Behavior*, *45*(3), 161–187.

Author, year	In-text Definition	Citation
King 2007[36]	an **organizational climate for innovation** can be defined as the extent to which the values and norms of an organization emphasize innovation(West & Anderson, 1996; West & Wallace, 1991). Although little is known about the organizational consequences of climate for innovation, and early investigations of creativity focused on the individual level of analysis (see Amabile, 1996), research has begun to follow a multi-level approach in establishing that innovation is crucial in the long-term survival of organizations (Anacona & Caldwell, 1987; Anderson, de Dreu,&Nijstad, 2004; Drazin, Glynn,&Kazanjian, 1999; Janssen, Van de Vliert, &West, 2004; Oldham & Cummings, 1996). For example, multiple measures of innovation were positively related to organizational effectiveness within the health care industry (West & Anderson, 1996). Damanpour's (1991) meta-analysis showed that managerial attitudes towards change were determinants of organizational innovation. Similarly, we expect that maintenance of a climate which supports the production and implementation of creative ideas or processes will be related to the performance of organizations. "In effect, research findings suggest that if the environment of teams is demanding and uncertain, it is likely they will have to innovate successfully in order to reduce the uncertainty and level of demand" (p. 138). (Janssen 2004) Following this theoretical rationale (see also Bunce & West, 1996), we theorize that innovative climates may act as a resource or support function by which employees can manage job demands.	West, M. A., & Farr, J. L. (1990). Innovation and creativity at work: Psychological and organizational strategies. Chichester, England: Wiley. Gonzalez-Roma, V., &West, M. A., (2004). Agreeing to disagree: Climate strength and innovation in work teams. Unpublished manuscript. University of Valencia. Amabile, T. M. (1988). A model of creativity and innovation in organizations. In B. M. Staw & L. L. Cummings (Eds.), Research in organizations (Vol. 10, pp. 123–167). Greenwich, CT: JAI Press. West, M. A., & Anderson, N. R. (1996). Innovation in top management teams. Journal of Applied Psychology, 81, 680–693. West, M. A., & Wallace, M. (1991). Innovation in health care teams. European Journal of Social Psychology, 21, 303–315.. Anacona, D., & Caldwell, D. (1987). Management issues facing new product teams in high technology companies. In D. Lewin, D. Lipsky, & D. Sokel (Eds.), Advances in industrial and labor relations (Vol. 4, pp. 191–221). Greenwich, CT: JAI Press. Anderson, N., de Dreu, C. K., & Nijstad, B. A. (2004). The routinization of innovation research: A constructively critical review of the state-of-the-science. Journal of Organizational Behavior, 25, 147–173. Drazin, R., Glynn, M. A., & Kazanjian, R. K. (1999). Multilevel theorizing about creativity in organizations: A sensemaking perspective. Academy of Management Review, 24, 286–307. Janssen, O., Van de Vliert, E., & West, M. (2004). The bright and dark sides of individual and group innovation: A special issue introduction. Journal of Organizational Behavior, 25, 129–145. Oldham, G. R., & Cummings, A. (1996). Employee creativity: Personal and contextual factors at work. Academy of Management Journal, 39, 607–634.

Author, year	In-text Definition	Citation
		Damanpour, F. (1991). Organizational innovation: A meta-analysis of effects of determinants and moderators. Academy of Management Journal, 14, 555–590. Bunce, D., & West, M. A. (1996). Stress management and innovation interventions at work. Human Relations, 49, 209–222.
Berg 1999[9]	Ekvall (1996) stated that the **organizational climate is important for creativity and innovation** among the members of the organization. The organizational climate includes such factors as attitudes, behaviour and feelings that are common in the organization and it exists independently of the perceptions and understandings of the members (Ekvall 1996).	Ekvall G. (1996) Organizational climate for creativity and innovation. *European Journal of Work and Organisational Psychology* **5,** 105–123.
Rashid 2020[32]	Ekvall (1996) stated that the organizational climate …is important for creativity and innovation among the members of the organization. The organizational climate includes such factors as attitudes, behaviour and feelings that are common in the organization and it exists independently of the perceptions and understandings of the members (Ekvall 1996). The **climate of creativity and innovation** was measured by the Creative Climate Questionnaire (Ekvall *et al*. 1983). It has 50 statements covering 10 dimensions of the work climate: challenge, freedom, idea-support, trust, dynamism, playfulness, debates, conflicts (counter indicative), risk-taking and idea-time (Ekvall *et al*. 1983). The statements are all geared to the capacity of the organization for change and innovation (Ekvall *et al*. 1987, Ekvall & Tångeberg-Andersson 1986) A low degree of creativity indicates that there is stagnation, and this, in turn, is said to have a negative impact on job satisfaction, well-being, productivity and quality at work (Ekvall 1991). The degree of creativity among the members of an organization may be the outcome of suitable support systems. Ekvall (1996) stated that the organizational climate is important for creativity and innovation among the members of the organization. The organizational climate includes such factors as attitudes, behaviour and feelings that are common in the organization and it exists independently of the perceptions and understandings of the members (Ekvall 1996). Thus, it seems important to take both intrapersonal and interpersonal factors as well as the actual organizational circumstances into consideration when devising suitable support systems for nurses.	Ekvall G. (1991) *Managing Innovation* (eds Henry, J. & Walker, D.), pp. 73–79. Sage Publications, London. Ekvall G. (1996) Organizational climate for creativity and innovation. *European Journal of Work and Organisational Psychology 5,* 105–123. Ekvall G., Arvonen J. & Nyström H. (1987) *Organisation and Innovation*. Studentlitteratur, Lund. Ekvall G., Arvonen J. & Waldenström-Lindström I. (1983) *Creative Organizational Climate Construction and Validation of a Measuring Instrument,* Report 2. FA-rådet, Stockholm. Ekvall G. & Tångeberg-Andersson Y. (1986) Working climate and creativity. A study of an innovative newspaper office. *Journal of Creative Behaviour* **3,** 215–225.

Author, year	In-text Definition	Citation
Jarvis 2017[11]	…we take creativity to refer to the generation of novel and useful ideas (Amabile et al, 1996) and innovation to relate to the successful implementation of creative ideas to create new value for the organisation and its stakeholders (West and Anderson, 1996). As Isaksen et al (2011:14) claim, "You can have creativity without innovation, but you cannot have innovation without creativity." This distinction has a particular resonance for our research since the leadership challenge we have uncovered is less about creativity and more about innovation and bringing new ideas, products and processes into practice. It is this translation of creative ideas into innovative products, services and processes that Byrne et al (2009) argue is critical to an organisation's survival and ability to thrive in an increasingly competitive and complex environment. Tidd and Bessant (2009: 16) suggest "…innovation is a process of turning opportunity into new ideas and of putting these into widely used practice." Others (*eg* West and Farr, 1990; Bledow et al, 2009) include intentionality in their definitions, claiming innovation can be defined as: "The intentional introduction and application within a role, group or organisation of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, the group, organisation or wider society." (West and Farr, 1990: 9) The innovation literature also focuses on different levels of analysis, from the personal level (e.g Kirton, 1976, 2003), through team level (West, 1990), to whole systems (Csikszentmihalyi, 1988) and the level of society (Simonton, 1999) and addresses them from different perspectives, including social and occupational psychologists, sociologists, management scientists, and organizational behaviourists (King, 1990). It is perhaps not surprising then that the innovation research is characterised by variability of findings (Aasen, 2009). In this paper our emphasis is on the team level and the role leadership learning can play in facilitating a **climate supportive of innovation**. In the words of Isaksen (2017: 131), "Creativity is the making and communicating of meaningful new connections and ideas. Innovation is the application and implementation of these insights. Edmondson's (1999) work in a health setting also stresses the importance of both psychological safety and the quality of relationship and trust between leaders and team members for learning and innovation to take place. These factors influence the way the group works with diversity, and its potential to offer challenge and surprise (Fonseca, 2002), for as West and	Amabile, T.M., Conti, R., Coon, H., Lazenby, J. and Herron, M. (1996) 'Assessing the Work Environment for Creativity' *Academy of Management Journal,* 39(5): 1154-1184. West, M.A. and Anderson, N.R. (1996) 'Innovation in Top Management Teams' *Journal of Applied Psychology,* 81(6): 680-693. Isaksen, S.G., and Ekvall, G. (2007). *Assessing the Context for Change: A Technical Manual for the Situational Outlook Questionnaire® - Enhancing Performance of Organizations, Leaders and Teams for Over 50 Years* (2nd ed.), Buffalo, NY, USA: The Creative Problem Solving Group, Inc. Byrne, C.L., Mumford, M.D., Barrett, J.D. and Vessey, W.B. (2009). "Examining the Leaders of Creative Efforts: What Do They Do, and What Do They Think About?' *Creativity and Innovation Management* 18, (4):256-268. Tidd, J. & Bessant, J. (2009) *Managing Innovation: Integrating Technological, Market and Organizational Change* (4th Ed), Hoboken, NJ: John Wiley & Sons. West, M. A. and Farr, J. L. (eds) (1990) *Innovation and Creativity at Work: Psychological and Organizational Strategies,* Chichester: John Wiley. Bledow, R., Frese, M., Anderson, N., Erez, M., & Farr, J. (2009) 'A Dialectic Perspective on Innovation: Conflicting Demands, Multiple Pathways, and Ambidexterity', *Industrial and Organizational Psychology*, 2, 305-337. Kirton, M.J. (1976) 'Adaptors and Innovators: A Description and Measure', *Journal of Applied Psychology,* 61: 622-629. Kirton, M.J. (2003) Adaption and Innovation in the Context of Diversity and Change, London: Routledge. Csikszentmihalyi, M. (1990). *Flow: The Psychology of Optimal Experience*, New York: Harper and Row. Simonton, K. (1999) *Origins of Genius: Darwinian*

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	Hirst (2003: 300) note: …functional or knowledge diversity in the team is associated with innovation. However, when diversity begins to threaten the group's safety and integration… Where diversity reduces group members' clarity about and commitment to group objectives, levels of participation … task orientation … and support for new ideas, then it is likely that innovation attempts will be resisted.	*Perspectives on Creativity*, New York: Oxford Univ Press. King, N. (1990) 'Innovation at Work: The Research Literature' in M. West and N. Farr (eds) *Innovation and Creativity at Work,* pp 15-59, Chichester: Wiley Aasen, T.M.B. (2009) 'A Complexity Perspective on Innovation Processes for Subsea Technology Development.' *International Journal of Learning and Change*, 3(3): 294–307. Edmondson, A. (1999) 'Psychological Safety and Learning Behavior in Work Teams' *Administrative Science Quarterly,* 44: 350-383 Fonseca, J. (2002) *Complexity and Innovation in Organizations,* London: Routledge. West, M.A. and Hirst, G. (2003) 'Co-operation and Teamwork for Innovation' in M.A. West, D. Tjosvold and K.G. Smith *International handbook of Organizational Teamwork and Cooperative Working,* Chichester: John Wiley.
Liu 2012[30]	In this study, we employed the well-established four-factor theory of **team climate for innovation** proposed by West.(35) This theoretical model identifies 4 essential factors of team climate, participative safety, support for innovation, vision, and task orientation. These factors represent the salient aspects of team climate that have been covered by scholars interested in understanding individuals' tendencies toward knowledge sharing. A team climate conducive to innovation is characterized as a climate in which individuals are highly trusting of others and of the organization (*eg* support for innovation), an open climate with free-flowing information and tolerance of well-reasoned failure (*eg* participatory safety), and a climate infused with pro-social norms (*eg* vision).(9)	35. West MA. The social psychology of innovation in groups. In: West MA, Farr JL, eds. Innovation and Creativity at Work: Psychological and Organizational Strategies. Chichester: Wiley, 1990;309-33. 9. Bock G, Zmud RW, Kim Y, Lee J. Behavioral intention formation in knowledge sharing: examining the role of extrinsic motivators, social-psychological forces, and organizational climate. MIS Quart 2005;29:87-112.
Dackert 2010[33]	In the present study, West's model was adopted for the purpose of studying team climate with regard to the innovative processes necessary for improving the quality and efficiency of the care. A study of primary health care teams by Proudfoot et al. (2007) showed a better team climate providing support of innovation to be associated with the patients greater satisfaction with the care they received. In addition, a **team climate that supports innovation** has been found to be related to	Proudfoot J., Jayasinghe U.W., Holton C. et al. (2007) Team climate for innovation: what difference does it make in general practice? International Journal for Quality in Health Care 19, 164–169. Rose J., Ahuja A.P. & Jones C. (2006) Attitudes of direct care staff towards external professionals, team climate and psychological well-being. Journal of Intellectual Disabilities 10, 105–120.

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	psychological well-being among direct care staff in homes for people with intellectual disabilities (Rose et al. 2006). Based on West's (1990) model, Anderson and West (1998) examined shared perceptions of team climate in relation to innovative processes; the model consists of 4 dimensions: participation, support for innovation, vision and task orientation. Participation refers to a positive interpersonal atmosphere with ample employee influence, interaction and communication. **Support for innovation** refers to the degree of encouragement and practical support given to employees attempting to improve their work. Vision comprises 4 components concerning team objectives: clarity, visionary nature, attainability and agreement. Lastly, task orientation refers to the team's shared concern about the quality of work (West 1990, Anderson & West 1998). These 4 dimensions have been shown to be related to innovation in teams (Agrell & Gustafson 1994, Anderson & West 1998). Moreover, innovation has been defined as the introduction and application of ideas, procedures, processes etc. within a role, group or organization (West & Farr 1990).	West M.A. (1990) The social psychology of innovation in groups. In Innovation and Creativity at Work. Psychological and Organizational Strategies (M.A. West & J.L. Farr eds), pp.309-333, John Wiley and Sons, Chichester.Anderson N.R. & West M.A. (1998) Measuring climate for work group innovation: Development and validation of the team climate inventory. Journal of Organizational Behavior 19, 235–258.
Proudfoot 2007[25]	*Collaborative teamwork provides a link between efficient organizational practice and high-quality patient care [1], with the team's ability to be innovative as 1 hypothesized mechanism.* **Innovative teams** are characterized by high levels of support and challenge, sharing and implementing new ideas and clarity of tasks and objectives [2]. Four team processes have been shown to be important: having clearly defined and valued group goals, participative decision-making, quality task orientation and **support for innovation** [3]. When these 4 factors are present, innovativeness and effectiveness are higher [4]. Innovative team processes are also associated with better quality care for patients and with team members' well-being and satisfaction…Specifically, teams that had clear, shared objectives were task-focused with an emphasis on quality, participated in decision making and open to innovation were more likely to work well as a team, structure their work more effectively and to be more effective in their health care delivery.	1. Mickan S, Rodger S. The organisational context for teamwork: comparing health care and business literature. Aust Health Rev 2000;23:179–92. 2. Guzzo R, Shea G. Group performance intergroup relations in organisations. In: Dunnette M, Hough L (eds). Handbook of Industrial and Organisational Psychology. Palo Alto, CA: Consulting Psychologists Press, 1992, pp. 269–313. 3. Anderson N, West M. Measuring climate for work group innovation: development and validation of the team climate inventory. J Org Behav 1998;19:235–58. 4. St John Burch G, Anderson N. What does it take to be a good team player? Assessing team climate preference can help. Select Dev Rev 2003;19:15–19.
Anderson 1998[26]	…**work group innovation** as being the facet-specific construct of interest in the present study. West and Farr, (1989) define innovation as `the intentional introduction and application within a role, group or organization	Siegel, S. M. and Kaemmerer, W. F. (1978). `Measuring the perceived support for innovation in

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	of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit role performance, the group, the organization or the wider society' (p. 16). Comparatively few studies have focused at the level-of-analysis of the work group. This is a notable shortcoming since it is often the case that an innovation is originated and subsequently developed by a team into routinized practice within organizations (West and Farr, 1990; Anderson and King, 1993; King and Anderson, 1995). `. . . the expectation, approval and practical support of attempts to introduce new and improved ways of doing things in the work environment' (West, 1990, p. 38). **Support for innovation** varies across teams to the extent that it is both articulated and enacted. West argues that articulated support, by implication, may be found in personnel documents, policy statements, or conveyed by word of mouth. It is argued that a necessary condition for group innovation is enacted support, as opposed to merely articulated support, whereby active support is provided for innovatory behaviour. Daft (1986), for instance, found that resources needed to be made available to develop innovations, whilst Schroeder, Van de Ven, Scrudder and Polley (1989) stressed the importance of support from the power elite for innovation implementation.	organizations', Journal of Applied Psychology, 63, 553-562. West, M. A. (1990). `The social psychology of innovation in groups'. In: West, M. A. and Farr, J. L. (Eds) Innovation and Creativity at Work: Psychological and Organizational Strategies, Wiley, Chichester, pp. 4-36. West, M. A. and Farr, J. L. (1989). `Innovation at work: psychological perspectives', Social Behaviour, 4, 15-30. West, M. A. and Farr, J. L. (Eds) (1990). Innovation and Creativity at Work: Psychological and Organizational Strategies, Wiley, Chichester. King, N. and Anderson, N. R. (1995). Innovation and Change in Organizations, Routledge, London. Anderson, N. R. and King, N. (1993). Innovation in Organizations. In: Cooper, C. L. and Robertson, I. T. (Eds) International Review of Industrial Organizational Psychology, Vol. 8, Wiley, Chichester, pp. 1-33. Daft, R. L. (1986). `A dual-core model of organization innovation', Academy of Management Journal,21,193-210. Schroeder, R. G., Van de Ven, A. H., Scrudder, G. D. and Polley, D. (1989). `The development of innovation ideas'. In: Van de Ven, A. H., Angle, H. L. and Poole, M. S. (Eds) Research on the Management of Innovation: The Minnesota Studies, Harper & Row, New York,pp.107-134.
Bunce 1995[10]	The influence of groups in determining at the outset the extent to which an individual's ideas for innovations are translated into practical action or rejected can therefore be considerable. There is certainly evidence that group climate factors have an important influence on **work-group innovation** (Anderson & West, 1992; West & Anderson, 1994; West & Wallace, 1992) and good reason for supposing that group climate will influence individual innovation attempts 4. **Support for Innovation**	Anderson. N.R., & West, M.A. (1992). *Team climate for innovation.* Memo Number 1430. Burningham, C., & West. M.A. (1995). Individual, climate, and group interaction processes as predictions of work team innovation. *Small Group Research, 26.* West, M.A.. & Anderson, N.R. (1994). *Predicting innovation in team at work: A test of the theory of group innovation.* Unpublished manuscript. Memo

Author, year	In-text Definition	Citation
	This is defined (West, 1990, p.38) as "The expectation, approval, and practical support of attempts to introduce new and improved ways of doing things in the work environment". Support for innovation vanes across teams to the extent that it is both articulated and enacted. West argues that articulated norms, by implication, may be found in personnel documents, or in policy statements, or conveyed by word of mouth. It is argued that a necessary condition for group innovation is enacted norms, as opposed to merely articulated norms whereby active support is provided for innovative behaviour-somewhat similar to Argyris' (1993a, b) distinction between espoused theories and theories in use. ***Propensity to Innovate…*** explored respondents' attitudes towards seeking out new and improved ways of working and was derived from an original 12-item scale (Burningham & West, 1995).	No. 1308. MRCESRC Social and Applied Psychology Unit, University of Sheffield, UK. West, M.A., & Wallace, M. (1992). Innovation in health care teams. *European Journal of Social Psychology, 21,* 303-31s. West, M.A. (1990). The social psychology of innovation in groups. In M.A. West & J.L. Farr (Eds.), *Innovation and creativity at work: Psychological and organizational strategies.* Chichester, UK: Wiley. Argyris, C. (1993a). On the nature of actionable knowledge. *The Psychologist,* 6(1), 29-32.
West 1991[39]	West and Farr (1989) argue, in a review of the literature, that **innovative groups** will be cohesive, have participative leadership, strong norms for innovation in the team climate, a focus on both rational and intuitive thinking, and a concern with quality of task performance. The individuals comprising such groups, they suggest, will have a high propensity to innovate and task appropriate skills. Similarly, both Kanter (1983) and Peters and Waterman (1982) suggest that innovation is most likely to occur where the leadership style is collaborative and participative.	West, M. A. and Farr, J. L. (1989). 'Innovation at work, Psychological perspectives', Social Behaviour, 4: 15-30. Kanter, R. (1983). The Change Masters, Simon and Schuster, London. Peters, T. J. and Waterman, R. H. (1982). In Search of Excellence. Lessons from America's Best Run Companies, Harper and Row, New York.
Weng 2015[18]	Employee **innovation behaviour** is influenced by the organisational climate that is perceived by employees. When the organisational behaviour climate is supportive of employee innovation behaviours, the employees are more willing to transform their creative ideas into innovative outputs (Weng et al. 2012a). Jong and Vermeulen (2003) identified that organisational climate is a critical factor to carry out new service development effectively. However, there are often various aspects of organisational climate existing at the same time in an organisation. Recently, for improving care quality, patient safety climate has already become a key management point in healthcare organisations (Hughes et al. 2009). In addition, a good innovation climate in organisations will provide the employees with resources, as well as technical and psychological support, to create a positive attitude toward innovation, and thus, enhance employee innovation performance (Sarros et al. 2008, Dackert 2010).	Weng R.H., Huang C.Y., Huang J.A. & Wang M.H. (2012a) The cross-level impact of patient safety climate on nursing innovation: a cross-sectional questionnaire survey. Journal of Clinical Nursing 21 (15–16), 2262–2274. Jeong S.Y. & Keatinge D. (2004) Innovative leadership and management in a nursing home. Journal of Nursing Management 12 (6), 445–451. Hughes L.C., Chang Y. & Mark B.A. (2009) Quality andstrength of patient safety climate on medical-surgical units. Health Care Management Review 34 (1), 19–28. Sarros J.C., Cooper B.K. & Santora J.C. (2008) Building a climate for innovation through transformational leadership and organizational culture. Journal of Leadership and Organizational Studies 15 (2), 145–158.

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	This study defines innovation behaviour as a process during which nurses reinforce the generation, establishment, evaluation and implementation of creative ideas. Healthcare innovation is about doing things differently or doing different things to achieve large gains in performance (McSherry & Douglas 2011). Nurse innovation behaviours cover the areas of research, clinical practices, management, education, technologies, public health and policies (Hughes 2006). Innovation in nursing practice could be seen as the encouragement of professionals to utilise their acquired knowledge and skills in order to generate and develop new ways of working creatively and drawing on technologies, systems, theories and associated partners/stakeholders that may further enhance and evaluate nursing practice (McSherry & Douglas 2011). For nurses, innovation refers to eliminating old care or improving existing care in order to develop new behaviours (Holleman et al. 2009); innovation behaviours refer to the degree of nurses' participation in work improvement, inviting others to participate, and nurses' adoption of the work improvement plan (_Amo 2006). According to Blakeney et al. (2009) nursing innovation is a process that brings creativity to measurable outcomes, actions, products or processes. Knol and van Linge (2009) argued that the generation, implementation and achievement of creative ideas, as well as the acceptance of innovation outcomes and seeking the support of others on innovation activities, are all essential for nursing innovation.	Dackert I. (2010) The impact of team climate for innovation on well-being and stress in elderly care. Journal of Nursing Management 18 (3), 302–310. McSherry R. & Douglas M. (2011) Innovation in nursing practice: a means to tackling the global challenges facing nurses, midwives and nurse leaders and managers in the future. Journal of Nursing Management 19 (2), 165–169. Hughes F. (2006) Nurses at the forefront of innovation. International Nursing Review 53 (2), 94–101. Holleman G., Poot E., Groot J.M.-D. & Achterberg T.V. (2009) The relevance of team characteristics and team directed strategies in the implementation of nursing innovations: a literature review. International Journal of Nursing Studies 46 (9), 1256–1264. _Amo B.W. (2006) Employee innovation behaviour in health care: the influence from management and colleagues. International Nursing Review 53 (3), 231–237. Blakeney B., Carleton P., McCarthy C. & Coakley E. (2009) Unlocking the power of innovation. OJIN: The Online Journal of Issues in Nursing 14 (2), 1–12. Knol J. & van Linge R. (2009) Innovative behaviour: the effect of structural and psychological empowerment on nurses. Journal of Advanced Nursing 65 (2), 359–370.
Nazir 2018[12]	According to West et al. [1], organizations rely on employees' **innovative behavior** [IB] to enhance efficiency and productivity, which in turn ensures continuous organizational growth, success, and survival [2–5]. Innovative behavior results in the generation of a new idea, effective multitasking procedures, and increases job-related motivation [6]. Martins & Terblanche [7] argues that organizations invest a significant amount of time and money to enhance the employee innovative behavior. Innovative behavior generates new ideas, including effective multitasking processes and job-related managerial motivation [6]. In order to organize the innovation process, firms take into consideration the various actors	1. West, M.A.; Hirst, G.; Richter, A.; Shipton, H. Twelve steps to heaven: Successfully managing change through developing innovative teams. Eur. J. Work Organ. Psychol. 2004, 13, 269–299. 2. Oldham, G.R.; Cummings, A. Employee creativity: Personal and contextual factors at work. Acad. Manag. J. 1996, 39, 607–634. 3. Scott, S.G.; Bruce, R.A. Determinants of innovative behavior: A path model of individual

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	that assist them in the development of employees' IB [7], and employees are expected to improve their organization's processes by producing and implementing innovative solutions that enhance both customer satisfaction and services [8]. McLean [44] defines IB as the creation of novel solutions and valuable ideas in different fields, while innovation refers to the effective execution of these novel solutions in the organization [44]. In other words, IB is known as the process of providing novel ideas to solve problems in organizational practice [45,46]. Jafri [46] proposes that knowledge can be utilized to stimulate novel ideas, which may, in turn, be applied to deliver enhanced customer service and solve problems creatively. It is argued that individual IB and the collective capacity of knowledge workers boosts innovation in organizations [47]. IB involves an improved way of performing tasks through a combination of new notions, processes, products, and services that are (a) unique, and (b) beneficial for the organization [6,48,49]. Such creative ideas can come from employees at any level or in any job within the organization and not only those jobs that usually demand IB [50,51]. Innovative behavior results in enhancing efficiency and effectiveness of employees and is generally considered to be an outcome of the interaction between innovative workers. However, Subramaniam & Youndt [52] emphasized that innovation is a management process that requires both managerial and organizational support. Similarly, Scott & Bruce [3] propose that IB requires a conducive organizational environment that consists of appropriate supervision and social relations at the workplace. These arguments are consistent with the characteristics of social exchange theory (SET). SET proposes that none of this can take place without the appropriate organizational support when employees recognize that their organization and supervisor are fair and supportive that ultimately develops an organizational culture, which supports and enhances IB [32,53,54].	innovation in the workplace. Acad. Manag. J. 1994, 37, 580–607. 4. Shalley, C.E. Effects of coaction, expected evaluation, and goal setting on creativity and productivity. Acad. Manag. J. 1995, 38, 483–503. 5. Woodman, R.W.; Sawyer, J.E.; Griffin, R.W. Toward a theory of organizational creativity. Acad. Manag. Rev. 1993, 18, 293–321. 6. Amabile, T.M.; Conti, R.; Coon, H.; Lazenby, J.; Herron, M. Assessing the work environment for creativity. Acad. Manag. J. 1996, 39, 1154–1184. 7. Martins, E.; Terblanche, F. Building organisational culture that stimulates creativity and innovation. Eur. J. Innov. Manag. 2003, 6, 64–74. 8. Dean, A.; Kretschmer, M. Can ideas be capital? Factors of production in the postindustrial economy: A review and critique. Acad. Manag. Rev. 2007, 32, 573–594. 35. Sarooghi, H.; Libaers, D.; Burkemper, A. Examining the relationship between creativity and innovation: A meta-analysis of organizational, cultural, and environmental factors. J. Bus. Ventur. 2015, 30, 714–731. 36. Chua, R.Y.; Roth, Y.; Lemoine, J.-F. The impact of culture on creativity: How cultural tightness and cultural distance affect global innovation crowdsourcing work. Adm. Sci. Q. 2015, 60, 189–227. 44. McLean, L.D. Organizational culture's influence on creativity and innovation: A review of the literature and implications for human resource development. Adv. Dev. Hum. Resour. 2005, 7, 226–246. 46. Jafri, M.H. Organizational commitment and employee's innovative behavior. J. Manag. Res. 2010, 10, 62–68. 47. Xerri, M.Workplace relationships and the innovative behaviour of nursing employees: A social

Author, year	In-text Definition	Citation
		exchange perspective. Asia Pac. J. Hum. Resour. 2013, 51, 103–123. 48. Shalley, C.E.; Zhou, J.; Oldham, G.R. The effects of personal and contextual characteristics on creativity: Where should we go from here? J. Manag. 2004,30, 933–958. 49. Zhou, J.; George, J.M. When job dissatisfaction leads to creativity: Encouraging the expression of voice. Acad. Manag. J. 2001, 44, 682–696. 50. Madjar, N.; Oldham, G.R.; Pratt, M.G. There's no place like home? The contributions of work and nonwork creativity support to employees' creative performance. Acad. Manag. J. 2002, 45, 757–767. 51. Nonaka, I. The knowledge-creating company. Harv. Bus. Rev. 1991, 69, 96–104. 52. Subramaniam, M.; Youndt, M.A. The influence of intellectual capital on the types of innovative capabilities. Acad. Manag. J. 2005, 48, 450–463. 53. Åmo, B. Employee innovation behaviour in health care: The influence from management and colleagues. Int. Nurs. Rev. 2006, 53, 231–237. 54. Cropanzano, R.; Prehar, C.A.; Chen, P.Y. Using social exchange theory to distinguish procedural from interactional justice. Group Organ. Manag. 2002, 27, 324–351.
Sommez 2019[38]	**Innovative behavior** (IB) is defined as all individual activities pertaining to the development, promotion and implementation of a useful innovation at any organizational level (Rank et al., 2004; Moisio et al., 2007). IB includes the development of new ideas, technology and techniques, as well as the trial and application of new methods related to business procedures in specific work areas (Moisio et al., 2007). Studies have emphasized the importance of developing IB in healthcare professionals to ensure that healthcare institutions are able to deliver rapid, reliable and high-quality patient care (Reuver et al., 2008; Xerri and Brunetto, 2012). IB practiced by healthcare professionals has been shown to be significant for	Rank, J., Pace, V.L. and Frese, M. (2004), "Three avenues for future research on creativity, innovation, and initiative", Applied Psychology: An International Review, Vol. 53 No. 4, pp. 518-528. Moisio, E., Lempiälä, T. and Nylander, M. (2007), "Invention rewards and innovativeness – a case study", RMC, Brussels. Reuver, M., Van Engen, M.L., Vinkenburg, C.L. and Wilson-Evered, E. (2008), "Transformational leadership and innovative work behaviour: exploring the relevance of gender differences", Creativity and Innovation Management, Vol. 17 No. 3, pp. 227-243.

Author, year	In-text Definition	Citation
	improving patient outcomes and organizational performance (Bunpin et al., 2016). There have been various studies conducted over the last decade investigating the factors responsible for developing IB in nurses (Knol and van Linge, 2009; Xerri and Brunetto, 2012; Xerri, 2013; Sönmez and Yıldırım, 2014; Koyuncu, 2015; Afsar and Masood, 2018; Afsar et al., 2018). These studies have revealed that the IB of nurses was associated with structural and psychological empowerment, interactional justice, perceived organizational support, leader–member exchange and person-organization fit (Knol and van Linge, 2009; Xerri and Brunetto, 2012; Afsar et al., 2018). In addition to these, supervisor supportiveness (SS) and autonomy have also been found to be important factors affecting the development of IB in nurses (Sönmez and Yıldırım, 2014). In a study conducted with physicians and nurses, the tendency toward IB and transformational leadership was determined to increase in line with certain personality traits, such as extraversion, agreeableness, self-discipline and emotional balance (Koyuncu, 2015). One of the organizational factors affecting innovation is organizational climate. It has been stated that to foster innovation, it is particularly important to create an organizational climate that is non-threatening psychologically, supports risk-taking and motivates the employees to apply initiative (Parzafall et al., 2008). It has also been emphasized that organizational support and SS, when perceived to be fair by employees, will improve IB (Xerri and Brunetto, 2012). Furthermore, 1 study has shown that organizational climate needs to include certain characteristics, such as team cohesion, SS, and autonomy, to foster the IB of employees (Balkar, 2015). A number of studies have investigated the correlation between organizational climate – 1 that supports innovation – creativity and IB (Scott and Bruce, 1994; Yu et al., 2013; Balkar, 2015; Shanker et al., 2017). For example, in the study by Scott and Bruce (1994) on this subject, they highlighted the necessity of having an organizational climate that supports IB and provides necessary resources, 2 qualification that serve as the basis of IB literature. In the qualitative study by De Jong and Den Hartog (2007), managers stated that the innovative climate of the organization was the precursor to employees' IB. Yu et al. (2013), in their study, reported there to be a positive correlation between knowledge sharing and IB and	Xerri, M. (2013), "Workplace relationships and the innovative behaviour of nursing employees: a social exchange perspective", Asia Pacific Journal of Human Resources, Vol. 51 No. 1, pp. 103-123. Bunpin, J.J., Chapman, S., Blegen, M. and Spetz, J. (2016), "Differences in innovative behavior among hospital-based registered nurses", The Journal of Nursing Administration, Vol. 46 No. 3, pp. 122-127. Knol, J. and Van Linge, R. (2009), "Innovative behavior: the effect of structural and psychological empowerment on nurses", Journal of Advanced Nursing, Vol. 65 No. 2, pp. 359-370. Xerri, M.J. and Brunetto, Y. (2012), "Social exchange and innovative behaviour of nursing employees: A hierarchical linear examination". Afsar, B., Cheema, S. and Bin Saeed, B. (2018), "Do nurses display innovative work behavior when their values match with hospitals' values?", Europan Journal of Innovation Management, Vol. 21, No. 1, pp. 157-171. Sönmez, B. and Yıldırım, A. (2014), "Determination of nurses' innovative behaviours and their views about the factors affecting their innovative behaviours: a qualitative study in a university hospital", Journal of Health and Nursing Management, Vol. 1 No. 2, pp.49-59.(in Turkish). Koyuncu, A.G. (2015), "Hastanelerde örgütsel yenilik: doktor ve hemşireler ile yapılan bir çalışma (Organisational innovation in hospitals: a study conducted for doctors and nurses)", HAK-İŞ Uluslararası Emek ve Toplum Dergisi, Vol. 4 No. 9, pp. 181-197 (in Turkish). Parzafall, M., Seeck, H. and Leppänen, A. (2008), "Employee innovativeness in organizations: a review", LTA, Vol. 2 No. 8, pp. 165-182.

Author, year	In-text Definition	Citation
	between a pro-innovation organizational climate and IB. Furthermore, Shanker et al. (2017), in their study, revealed that the innovative climate of an organization improves IB. Four factors help to facilitate the structural empowerment of employees, namely, opportunity, knowledge, support and organizational resources. Nurses who are highly empowered have been identified to display more IB (Knol and van Linge, 2009). In a study by Xerri (2013), the mediating role of perceived organizational support that lies between leader–member exchange and the IB of nurses was described. There is a consensus on the view that nurses are creative in finding solutions to problems involving healthcare services and patient care (Gillmartin, 1999). Management support hasbeen shown to significantly contribute to transforming employees' creative ideas into marketable innovations (Parzafall et al., 2008). IB has also often been studied in correspondence with the leadership styles of managers (Scott and Bruce, 1994; Wilson-Evered et al., 2001; Afsar and Masood, 2018). One of the work-related factors affecting IB is autonomy. Autonomy is stated to be 1 of the main antecedents of IB (De Spiegelaere et al., 2014).	Balkar, B. (2015), "The relationships between organizational climate, innovative behavior and job performance of teachers", International Online Journal of Educational Sciences, Vol. 7 No. 2, pp. 81-92. Scott, S.G. and Bruce, R.A. (1994), "Determinants of innovative behavior: a path model of individual innovation in the workplace", Academy of Management Journal, Vol. 37 No. 3, pp. 580-607. Yu, C., Yu, T.-F. and Yu, C.-C. (2013), "Knowledge sharing, organizational climate, and innovative behavior: a cross-level analysis of effects", Social Behavior and Personality, Vol. 41 No. 1, pp. 143-156. De Jong, J.P.J. and Den Hartog, D.N. (2007), "How leaders influence employees' innovative behaviour", European Journal of Innovation Management, Vol. 10 No. 1, pp. 41-64. Gillmartin, M.J. (1999), "Creativity: the fuel of innovation", Nurse Administration Quarterly, Vol. 23 No. 2, pp. 1-8. Wilson-Evered, E., Härtel, C.E.J. and Neale, M. (2001), "A longitudinal study of work group innovation: the importance of transformational leadership and morale", Advances in Health Care Management, Vol. 2, pp. 315-340. Afsar, B., Cheema, S. and Bin Saeed, B. (2018), "Do nurses display innovative work behavior when their values match with hospitals' values?", Europan Journal of Innovation Management, Vol. 21, No. 1, pp. 157-171. De Spiegelaere, S., Van Gyes, G., De Witte, H., Niesen, W. and Van Hootegem, G. (2014), "On the relation of job insecurity, job autonomy, innovative work behaviour and the mediating effect of work

Author, year	In-text Definition	Citation
		engagement", Creativity and Innovation Management, Vol. 23 No. 3, pp. 318-330.
Kim 2015[19]	**Innovative behaviors** occur when members of an organization generate new ideas and apply them to specific activities to improve individual and organizational achievement.3,10,11 Innovative behaviors are influenced by the personal characteristics of the members as well as organizational characteristics such as its atmosphere, structure, and culture.3 Individual innovative behavior is initiated, and then the innovation of a team or organization is implemented through a mutual network and member communication.12 Self leadership and individual voluntary efforts affect creativity and innovative behaviors13 and can lead to a strong sense of accomplishment with regard to work and activities.14 Creative self-efficacy is defined as confidence in one's ability and includes creative problem-solving based on the situation.15 Individuals with high creative self-efficacy are more likely to be able to successfully perform a particular task and can more efficiently mobilize the cognitive resources, motivation, and activities needed to meet the situation.16 Knowledge sharing is important for the knowledge-based management process of the organization; it plays an important role in exhibiting innovative behaviors and is relatively effective when knowledge is shared and exchanged within the organization.17 An innovative organizational culture is formed, and the thinking, attitudes, and behavior of its members become more innovative.18,19 In other words, members are more likely to behave in innovative ways because the organization motivates these behaviors by supporting the generation of new ideas and forming a culture in which the ideas can be actively used.20 The innovative behavior model21 asserts that individual attributes, team-member exchanges, and leader member exchanges directly and indirectly influence individual innovative behaviors through social and psychological environments. The innovation-creativity environment model12 states that creativity is closely related to the organizational environment and emphasizes that innovation occurs within a team and organization through member interactions as a result of individual creativity. …self-leadership was considered an individual attribute, individual knowledge sharing was considered a team-member exchange, and organizational knowledge sharing was considered a leader-member exchange. Three variables evaluated the effect on individual innovative	Kim DW. A research on the relationship between core self evaluations and innovative behavior intentions with self leadership as a mediator in the small-medium sized healthcare organizations. Health Soc Welfare Rev. 2014;34(1):408-435. 10. Song JS, Yang PS. A study on mediating effects of organizational commitment on the relationships between self-leadership and innovative behavior. Korean Corp Manage Rev. 2008; 15(1):189-209. 11. De Jong K, Den Hartog D. Measuring innovative work behavior. Creat Innov Manage. 2010;19(1):23-26. 12. Blakeney BA, Carleton RF, McCarthy C, Coakley E. Unlocking the power of innovation. Online J Issues Nurs. 2009;14(2). 14. Carmeli A, Meitar R, Weisberg J. Self-leadership skills and innovative behavior at work. Int J Manpower. 2006;27(1):75-90. 15. Tierney P, Farmer SM. Creative self-efficacy development and creative performance over time. J Appl Psychol. 2011;96(2): 277-293. 16. Michael LA, Sheng TH, Hsueh LF. Creative self-efficacy and innovative behavior in a service setting: optimism as a moderator. J Creat Behav. 2011;45(4):258-272. 17. Mura M, Lettieri E, Radaelli G, Spiller N. Promoting professionals innovative behaviour through knowledge sharing: the moderating role of social capital. J Knowl Manage. 2013;17(4):527-544. 18. Kwon JS. The influence of innovative organization culture to human resource innovation and organizational commitment. J Bus Res. 2011;23(1):153-182. 19. Chang JC, Yang YL. The effect of organization's innovational climate on student's creative self-

Author, year	In-text Definition	Citation
	behavior through creative self-efficacy and innovative organizational culture (Figure 1). Self-leadership is an important factor that affects innovative behavior,14 and creativity self efficacy 22,23 causes a strong sense of accomplishment in helping to perform duties. Individual knowledge sharing plays an important role in the realization of creative self-efficacy and individual innovation behavior, 11 as well as improves the quality of the relationships among team members.21 Individuals with creative self-efficacy successfully generate innovation as a result of mobilizing activities, motivation, and human resources.16 Organizational knowledge sharing plays an important role in demonstrating the creativity of an organization as well as creates organizational competency through the exchange and expansion of knowledge between members.24,25 **Innovative organizational culture** plays an important role in generating human resource innovation and stimulating innovative activities by adjusting the work environment.18 The innovation of an organization exists through individual innovative behaviors because the individual accepts and interprets the idea, and the organization adopts the breakthrough innovation.5,6	efficacy and innovative behavior.Bus Entrepreneur J. 2012;1(1):75-100. 20. Kim IC, Kim JW, Lee JW. Determinants of innovative work behavior. J Bus Res. 2004;19(2):282-317. 21. Scott SG, Bruce RA. Determinants of innovative behavior: a path model of individual innovation in the workplace. Acad Manage J. 1994;37(3):580-607. 22. Mansor A, Darus A, Dali MH. Mediating effect of self-efficacy on self-leadership and teachers_ organizational citizenship behavior behavior: a conceptual framework. Int J Econ Bus Manage Stud. 2013;2(1):1-11. 23. Masood K, Shahzad C, Nosheen R, Awais K. Effects of self leadership, knowledge management and culture on creativity. Eur J Bus Manage. 2011;3(8):1-12. 24. Moon IO. The effect of knowledge sharing on innovative behavior and organizational commitment in clinical nurses. J Korean Acad Nurs Adm.2005;11(2):173-183. 25. Richter AW, Hirst G, van Knippenberg D, Baer M. Creative self-efficacy and individual creativity in team contexts: cross level interactions with team informational resources. J Appl Psychol. 2012;97(6):1282-1290. 5. Ko DY, Yoo TY. The effect of job autonomy on innovation behavior: the mediating effect of job satisfaction and moderating effects of personality and climate for innovation. Korean J Ind Organ Psychol. 2012;25(1):215-238. 6. Shim DS, Ha SW. A study on the relationship between job characteristics and innovative behavior: the mediating effect of self-efficacy. Korean J Ind Res. 2013;9:95-124.C
Weng 2012[37]	Nursing innovation not only contributes to enhancing the quality of healthcare but also facilitates nursing productivity (Moody 2004, Chang & Liu 2008).	Amo BW (2006) Employee innovation behaviour in health care: the influence from management and

Author, year	In-text Definition	Citation
	Innovation is viewed as a multistage process. The entire process includes generating ideas, building coalitions, realizing ideas and innovation diffusion (Scott & Bruce 1994, Rogers 1995). **Employee innovation behaviour** is the conduct and performance of employees striving to achieve new levels of improvement, as well as the innovative activities revealed after experiencing multiple stages of progress (Hofmann & Mark 2006, Chang & Liu 2008). For nurses, nursing innovation refers to nurses improving nursing quality, inviting people alike to participate, using improvement programs and developing novel nursing behaviour (Amo 2006, Holleman et al. 2009). Specifically, innovation is the motivation and cognitive process derived from a desire to improve tasks. Apart from generating, processing and realising creativity, innovation also includes accepting new concepts and seeking the support and cooperation from others to implement novel activities or technologies (van der Weide & Smits 2004, Kotwal 2005). In addition to realising knowledge creation, integrating innovation into daily nursing routines is an imperative. Hansen and Birkinshaw (2007) indicated that the value of in-house innovation comprises generating, transforming and diffusing opinions. Thus, all 3 types of innovative dimensions must be accounted for when investigating nursing innovation. This study believes that in-house creativity is generated through the creation of knowledge among employees (Smith et al. 2005). Creative transformation involving new knowledge can result in innovative behaviour. If employee innovation behaviour is affirmed by colleagues, superiors and subordinates, this behaviour is likely to diffuse.	colleagues. International Nursing Review 53, 231–237. Chang L & Liu C (2008) Employee empowerment, innovative behavior and job productivity of public health nurses: a cross-sectional questionnaire survey. International Journal of Nursing Studies 45, 14–42. Moody RC (2004) Nurse productivity measures for the 21st century. Health Care Management Review 29, 7–19. Rogers EM (1995) Diffusion of Innovations, 4th edn. Free Press, New York, NY. Scott SG & Bruce RA (1994) Determinates of innovative behavior: a path model of individual innovation in the workplace. Academy of Management Journal 37, 580–607. Hofmann DA & Mark B (2006) An investigation of the relationship between safety climate and medication errors as well as other nurse and patient outcomes. Personnel Psychology 59, 847– 869. Holleman G, Poot E, Mintjes-de Groot J & van Achterberg T (2009) The relevance of team characteristics and team directed strategies in the implementation of nursing innovations: a literature review. International Journal of Nursing Studies 46, 1256–1264. van der Weide M & Smits J (2004) Adoption of innovations by specialised nurses: personal, work and organizational characteristics. Health Policy 68, 81–92. Kotwal A (2005) Innovation, diffusion and safety of a medical technology: a review of the literature on injection practices. Social Science & Medicine 60, 1133–1147. Smith KG, Collins GJ & Clark KD (2005) Existing knowledge, knowledge creation capability, and the rate of new product introduction in high-technology firms. Academy of Management Journal 48, 346–357.

Author, year	In-text Definition	Citation
		Hansen MT & Birkinshaw J (2007) The innovation value chain. Harvard Business Review 85, 121–130.
Acar 2012[23]	***Adhocracy* (creative) culture** with its external-oriented and dynamic structure refers to the culture of an organization in entrepreneurial, flexible, innovative and creative areas. Employees can take the initiative, supported with new discoveries and freedoms so they feel satisfied, happy and successful in this environment (Berrio, 2003, Cameron & Quinn, 1999; Erdem, 2007). Innovativeness is the measure of the degree of newness of an innovation. According to the literature most seen classification of innovativeness is product and process innovation. In current research, in order to measure **organizational innovation**, 18-item Likert scales of Wang and Ahmed (2004) and Jansen et. al. (2006) is given to the participants.	Berrio, A.A. (2003) An organizational culture assessment using the competing values framework: A profile of Ohio State Unive Journal of Extension, 41(2). Jansen, J.J.P., Van Den Bosch, F.A.J., and Volberda, H.W. (2006). Exploratory innovation, exploitative innovation, and performance: Effects of organizational antecedents and environmental moderators. Management Science, 52(11), 1661-1674. Wang, C.L., and Ahmed, P.K. (2004). The development and validation of the organisational innovativeness construct using confirmatory factor analysis. European Journal of Innovation Management, 7(4), 303-313. Cameron, K.S., and Quinn, R.E. (1999). Diagnosing and changing organizational culture: Based on the competing values framework. Reading, MA: Addison-Wesley.
Mesfin 2020[22]	A major goal of the **adhocracy culture** is to foster adaptability, flexibility, and creativity where uncertainty, ambiguity, and information overload are typical. An important challenge for these organizations is to produce innovative products and services and to adapt quickly to new opportunities.	Cameron KS, Quinn RE. Diagnosing and changing organizational culture:based on the competing value framework. New York: Wiley; 2012.
Gozukara 2019[14]	**Development culture** is a type of organisational culture that fosters employee motivation, especially regarding learning processes (Scott, Mannion, Marshall, & Davies, 2003). The important factors in this culture include growth, encouragement, creativity and diversification. Development culture involves and empowers significant values and attitudes directly related with the work of employees (Akkoc¸, C¸ alıs¸kan, & Turunc, 2012). Thus, it provides more focus and stability in terms of identifying and setting ground for such values. It also enables flexibility with a focus on external environment. The orientation of this culture is towards improvement, innovation and continuous adaptation to changing environment. Therefore, organisations with a development culture are	Scott, T., Mannion, R., Marshall, M., & Davies, H. (2003). Does organizational culture influence healthcare performance? A review of the evidence. Journal of Health Services Research and Policy, 8(2), 105–117. Akkoc¸, I˙, C¸ alı s¸kan, A., & Turunc¸, O¨ . (2012). O¨ rgu¨tlerde gelis¸im ku¨ltu¨ru¨ ve algılanan o¨rgu¨tsel desteg˘in is¸ tatmini ve is¸ performansına etkisi: Gu¨venin aracı rolu¨. Yo¨netim ve Ekonomi, 19(1), 105–135. Elfaituri, A. A. (2012). An assessment of TQM implementation, and the influence of organizational

Author, year	In-text Definition	Citation
	likely to strive for meeting their customers' expectations through constant innovative activities (Elfaituri, 2012).	culture on TQM implementation in Libyan banks (PhD thesis). University of Gloucestershire.
Chan 2008[50]	Adopting a **human- and innovation- oriented culture**, which allows employees to solve problems and learn to improve from mistakes, will be perceived by employees as benevolent support which is then translated into trust. This convinces employees to exercise their self-determination and enhances their competency to freely experiment with learning new ways to do things without fear of being unfairly penalized. Employees confidently seek to gain better control and power in their work environment through trusting their supervisors, thus enabling them to get involved in contributing to the overall achievement of organization goals. Such acts contribute to employees' perception of supervisors' integrity and depend- ability. Four major positive characteristics of the social structural factors which theorists and practitioners have identified (Conger and Kanungo, 1988; Kanter, 1983; Thomas and Velthouse, 1990) are predicted to have a positive direct effect on subordinates' trust and subsequently the extent of employees' perceived psychological empowerment. These are: (1) the organic or mechanistic nature of the organization, (2) the extent of social political support, (3) the extent of re- source and information support, and (4) the human- and innovation-oriented organization culture. Organization culture was measured with the eight-item human- and innovation-oriented values extracted from the Competing Values Model of Organizational Culture (Quinn and Spreitzer, 1993)	Conger, J. A. and R. N. Kanungo. 1988. "The Empowerment Process: Integrating Theory and Practice." Academy of Management Review 13 (3): 471-482. Spreitzer, G. M. 1996. "Social Structural Characteristics of Psychological Empowerment. Academy of Management Journal. 49 (2): 483-504 Kanter, R. M. 1986. "Empowering People to Act on Ideas." Executive Excellence (February): 5-6. Quinn, R. E. 1988. Beyond Rational Management: Mastering the Paradoxes and Competing Demands of High Performance. San Francisco, CA: Jossey

APPENDIX E. STUDY & METRIC(S) CROSSWALK

Instruments used in multiple studies (n=7)

- measured culture of innovation (n=6); described organization culture using pre-specified categories (n=1)

Instrument	Study																	Total
	Liu 2012[30]	Proudfoot 2007[25]	Sommez 2019[38]	West 1991[39]	Phung 2016[29]^	Apekey 2011[15]	Nieboer 2012[20]	Cramm 2013[8]^	Dackert 2010[33]	Rashid 2020 [32]	Nowak 2019[16]	Anderson 1998[26]	Bunce 1995[10]	Nazir 2018[12]	King 2007[36]	Chan 2008[50]+	Buschgen 2013[3]+	
Team Climate Inventory[43]	X	X							A	A	A		A		A			7
Climate for Innovation (Scott & Bruce)[27]			X								A							2
Climate for Innovation (Siegel & Kaemmerer)[45]				X								A						2
Culture of Innovation[44]					X	X												2
Group Innovation Inventory[28]							X	A										2
Innovative Work Behavior[27]			X											A				2
Competing Values Model of Organizational Culture[41]																O	O	2

^=study with program/intervention; +=study with organizational culture metric; X=instrument without adaptation; A=adapted/modified/truncated instrument; H=homegrown instrument; O=organizational culture metric

Instruments used in a single study (n=21)

- measured culture of innovation (n=20); described organization culture using pre-specified categories (n=1)

Instrument	Study															
	Berg 1999[9]^	Gozukara 2019[14]	Kim 2015[19]	Liebe 2017[24]	Nazir 2018[12]	Roen 2018[34]	Yan 2020[31]	Lansisalmi 1999[35]	Acar 2012[23]	Bunce 1995[10]	Jarvis 2017[11]^	Weng 2015[18]	Weng 2012[37]	Munoz-van den Evnde 2015[21]	West 1991[39]	Mesfin 2020[22]+
Creative Climate Questionnaire[58]	X															
Development Culture instrument[59]		X														
Individual Innovative Behaviors[60]			X													
Innovation Capability of CIOs[61]				X												
Innovative Organizational Culture[62]					A											
Innovative Organizational Culture[63, 64]			X													
Nordic Questionnaire for Psychosocial & Social Factors at Work[65]						A										
Nurse Organizational Innovation Climate Scale[66]							X									
Organizational Health Survey[67]								A								
"Organizational Innovation" (Wang & Ahmed)[42]									A							
"Organizational Innovation" (Janssen)[68]									A							
Propensity to Innovate[69]										A						
Situational Outlook Questionnaire (SOQ)[40]											X					
Composite Innovation Score[10]										H						
"Innovation Climate"[18]												H				
"Nurse Innovation Behavior"[18]												H				
"Nursing innovation"[37]													H			
Radiography of Innovation Culture-Multidimensional Questionnaire (RIC-MQ)[21]														H		
Role Innovation Score[39]															H	
Total Innovation Score[39]															H	
Organizational Culture Assessment instrument (OCAI)[70]																O

^=study with program/intervention; +=study with organizational culture metric; X=instrument without adaptation; A=adapted/modified/truncated instrument; H=homegrown instrument; O=organizational culture metric

APPENDIX F. EVIDENCE TABLES

STUDIES WITH PROGRAM/INTERVENTION (N=4)

Studies which measured Culture of Innovation using an instrument without adaptation (n=3)

Author, year	Sample, size (Response rate) Setting	Program/ Intervention	Study design Data analysis	Culture of innovation metric	Other metrics	Findings from abstract
Berg 1999[9]	22 nurses (100%) 1 psychiatric ward Sweden	One year of regular, systematic, clinical, group supervision combined with supervised individually planned and documented nursing care in a psychiatric ward United Kingdom	Pre-post Descriptives Regression	Creative Climate Questionnaire (CCQ) 50 statements covering 10 dimensions: • Challenge • Freedom • Idea-support • Trust • Dynamism • Playfulness • Debates • Conflicts • Risk-taking • Idea-time	• Sense of Coherence scale (SOC), 29 items, 3 components • Work-Related Strain Inventory (WRSI), 18 statements • Satisfaction with Nursing Care and Work questionnaire (SNCW), 34 statements plus section about nurses' background	"The baseline values for the CCQ indicated a stagnant organization and a high score in the conflict dimension indicated personal and emotional tensions within the organization. The intervention led to a significantly increased creative and innovative climate in the dimensions for trust, idea time and reduced conflicts. However, the organizational climate remained stagnant. The nurses' view of the effects from clinical supervision also increased significantly. There were no significant changes in the nurses' [Satisfaction with Nursing Care and Work] SNCW, [Work-Related Strain Inventory] WRSI or [Sense of Coherence] SOC score. The result of the correlation analysis indicated that a strong sense of coherence was related to low work-related strain but not to unsatisfactory working conditions/milieu."
Jarvis 2017[11]	147 respondents from 24 teams	Leadership development programs	Repeated measures	Situational Outlook Questionnaire		"In the follow-up survey, up to 3 years after the programme had finished, 45% of respondents

	(No response rate) Various healthcare organizations United Kingdom	focused on leadership for innovation, with participants drawn from across the health sector in the south west of England.	Descriptives	9 dimensions, 53 questions		claimed the influence of their leadership learning remained "about the same", while 42% said it had "snowballed". Our findings highlight the important role embodied leadership learning and the space for reflection play in encouraging participants to: reconnect with purpose; create protected time and space; embrace constructive challenge; foster diversity of thinking; grow peer networks; encourage appropriate risk-taking and a sense of 'playfulness' in making innovation happen."
Phung 2016[29]	2743 paramedics (12%) 11 ambulance services United Kingdom	Explored the relationship between clinical leadership behavior, organizational culture of innovation and clinical engagement in QI among ambulance clinicians participating in this large-scale national ambulance Quality Improvement Collaborative (QIC)	Cross-sectional Descriptives Regression	Organizational culture for innovation: 7 dimensions • Risk • Resource • Sharing of knowledge • Targets • Tools and techniques • Rewards • Relationships	• Demographics • Leadership behavior • Use and effectiveness of QI methods	"There were 2743 (12% of 22 117) responses from 11 of the 12 participating ambulance services. In the 3% of responders that were directly involved with the QIC, leadership behaviour was significantly higher than for those not directly involved. QIC involvement made no significant difference to responders' perceptions of the culture of innovation in their organization, which was generally considered poor. Although uptake of QI methods was low overall, QIC members were significantly more likely to use QI methods, which were also significantly associated with leadership behaviour."

Studies which measured Culture of Innovation using an instrument with adaptation (n=1)

Author, year	Sample, size (Response rate) Setting	Program/ Intervention	Study design Data analysis	Culture of innovation metric	Other metrics	Findings from abstract
Cramm 2013[8]	307 team members (26%) and 158 teams (52%) Various healthcare workers The Netherlands	12 QI teams participated in a national Dutch quality program (Care for Better) between 2006 and 2011, which focused on improving 1 specific quality topic varying from malnutrition to process redesign	Repeated measures Descriptives Regression	Group Innovation Inventory (GII) 15 items, 4 dimensions: *Team level:* group functioning, speed of action *Organizational level*: risk taking, tolerance of mistakes	• Age, gender, education • Perceived team effectiveness (4 questions, 7 items drawn from existing questionnaires) • Management support (9 questions)	"Two-tailed paired t-tests showed that innovative culture was slightly but significantly lower at T1 compared to T0 (12 months and 2-3 months after the start of the collaborative, respectively). Univariate analyses revealed that perceived effectiveness, organizational and management support were significantly related to innovative culture at T1 (all at $p<0.001$). Multilevel analyses showed that perceived effectiveness, organizational support, and management support predicted innovative culture. Our QI teams were not able to improve innovative culture over time, but their innovative culture scores were higher than non-participant professionals."

STUDIES WITHOUT PROGRAM/INTERVENTION (N=26)

Studies which measured Culture of Innovation using a single instrument without adaptation (n=7)

Author, year	Sample (Response rate) Setting	Study design Data analysis	Culture of innovation metric	Other metrics	Findings from abstract
Apekey 2011[15]	63 general practice quality improvement leads (65%) General practices in 1 county United Kingdom	Cross-sectional Descriptives	Culture of innovation, 7 items (NHS Institute for Innovation and Improvement)	• Demographic characteristics • Leadership behavior, 12 items, adapted (Kouzes and Posner) • Previous experience of quality improvement tools and techniques, 22 items	Sixty-three completed questionnaires (62%) were returned. Leadership behaviours were not commonly reported. Most practices reported a positive culture of innovation, featuring relationship most strongly, followed by targets and information but rated lower on other dimensions of rewards, risk and resources. There was a significant positive correlation between leadership behaviour and the culture of innovation ($r = 0.57$; $P < 0.001$). Apart from clinical audit and significant event analysis, quality improvement methods were not adopted by most participating practices.
Gozukara 2019[14]	488 employees (95.7%) Hospitals Turkey	Cross-sectional Structural equation modeling	Development culture, 8 items (Tseng and Lee)	• Demographic characteristics, 5 items • Top quality management, 16 items, 4 dimensions (Coyle & Shapiro, Zeitz, Johannesson, & Ritchie) • Employee empowerment, 9 items, 3 dimensions (Ugboro and Obeng) • Top management leadership, 9 items, 3 dimensions (Ugboro and Obeng)	The findings revealed that while development culture has a positive influence on TQM, it is the top management leadership which mediates this relationship, not the employee empowerment. The results are discussed considering the difference in these mediating effects and organisational implications of the findings are provided.
Liebe 2017[24]	142 CIOs (11.1%) 344 hospitals	Cross-sectional Descriptives Regression	Innovation capability of CIOs 3 sub-scores (Esdar)	• Status quo of IT management, 8 items • Structural hospital demographics, 4 items	The results show that CIOs' perceived innovation capability could be explained significantly (R2 =0.34) and exclusively by facts that described the degree of formalism and structure of IT management in a hospital,

	Germany			• Individual characteristics of CIO, 4 items	*eg* intensive and formalised strategic communication, the existence of an IT strategy and the use of IT governance frameworks. Breaking down innovation capability into its constituents revealed that "innovative organisational culture" contributed to a large extent (R2 =0.26) to the overall result sharing several predictors. In contrast, "intrapreneurial personality" (R2 =0.11) and "openness towards users" (R2 =0.18) could be predicted less well. These results hint at the relationship between working in a well-structured, formalised and strategy-oriented environment and the overall feeling of being capable to promote IT innovation.
Liu 2012[30]	212 medical center administrators and managers (58.24%) 28 computer information and management teams in 1 hospital Taiwan	Cross-sectional Structural equation modeling	"Support for innovation", measured, 8 items—one of 4 dimensions of Team Climate Inventory (TCI) 38 items, 4 dimensions (Anderson and West)	• Knowledge sharing behavior inventory, 4 items (Cheng & Lee) • Altruism inventory, 4 items, modified and adapted (Podsakoff, MacKenzie, Moorman and Fetter)	The influence of the team innovation climate on knowledge sharing behavior was evident. Furthermore, individuals' altruistic intentions played a full mediating role in the relationship between team innovation climate and knowledge sharing behavior.
Nieboer 2012[20]	432 participants (27.5%) & 37 organizations (27.2%) Healthcare professionals working in nursing/elderly homes; caring for handicapped;	Cross-sectional Descriptives Multilevel regression analysis	Group Innovation Inventory, 36 items, 4 dimensions (Caldwell & O'Reilly, Strating & Nieboer)	• Environmental dynamism, 3 items • Environmental competitiveness, 3 items • Centralization, 5 items • Formalization 4 subscales, 12 items • Communication, 3 subscales, 14 items • Leadership styles, 15 items	The determinants of an innovative culture were estimated with a two-level random-intercepts and fixed-slopes model. Multilevel regression models were used to account for the organizational clustering of individuals within the 37 care organizations. Environmental dynamism, job codification, formal external exchange of information, transformational leadership, commitment to quality, and an exploratory and exploitative innovation strategy were all significantly

	and long-term mental health The Netherlands			• Quality improvement commitment, 14 items • Exploratory innovation strategy of the organization, 6 items • Exploitative innovation strategy, 6 items	correlated with an innovative culture in the multivariate multilevel analysis; the other characteristics were not. The explained organizational- and individual-level variance was 52.5% and 49.2%, respectively.
Proudfoot 2007[25]	TCI: 653 doctors and staff from 93 practices (68%) Job satisfaction: 654 doctors and staff from 95 practices (65%) 7505 patients from 96 practices (60%) Across 6 Australian states and territories Australia	Cross-sectional Multiple linear regression Multi-level regression analysis	"Support for innovation", 8 items—one of 5 dimensions of Team Climate Inventory (TCI), 44 items, 5 dimensions (adapted from Anderson and West)	• The General Practice Assessment Survey, 53 items, 10 dimensions • Overall Job Satisfaction Scale, 15 items + 1 additional item • Practice characteristics, number of items unknown	Mean scores of team climate in Australian general practices were similar to those reported in the UK, except that in our study there was no association between the number of doctors in a practice and their team climate. Better team climate was found in practices with fewer non-clinical staff. Team climate predicted the job satisfaction of the general practitioners and staff, irrespective of the number of practice staff. Better team climate was associated with greater satisfaction by patients with their care.
Yan 2020[31]	4,677 nurses (78%) 18 hospitals in 3 regions China	Cross-sectional Descriptives Structural equation modeling	Nurse Organizational Innovation Climate Scale, 21 items, 3 dimensions (Qian)	• Demographics, 11 variables • Job Control Scale, 18 items, 3 dimensions (Dwyer and Gangster 1991) • Nurse Psychological Capital Questionnaire (PCQ-R for Chinese), 14 items, 4 dimensions (Luo & He, 2010) • Nurse Innovation Behavior Scale, 10 items, 3 dimensions (Bao)	According to the serial-multiple mediation, the mediating role of job control and perceived organisational innovation climate between psychological capital and innovative behaviour is significant. ($Z = 7.25$, $p < .05$).

Studies which measured Culture of Innovation using a single adapted/modified/truncated instrument (n=6)

Author, year	Sample (Response rate) Setting	Study design Data analysis	Culture of innovation metric	Other metrics	Findings from abstract
Anderson 1998[26]	155 individuals (63.7%) 27 hospitals United Kingdom	Cross-sectional Descriptives Confirmatory Factor Analysis	Support for innovation, 8 items (4 items from Siegel and Kaemmerer, 4 new items)	• Vision, 12 items (Burningham & West) • Participative safety, 24 items, 2 components (Wall and Lischeron, Tjosvold, Wedley and Field) • Task orientation, 17 items, 2 components (Burningham & West; Tjosvold, Wedley and Field)	This 5-factor, 38-item summarized version demonstrates robust psychometric properties, with acceptable levels of reliability and validity.
Dackert 2010[33]	329 auxiliary nurses and nurses' aides (67%) 1 unit of elderly care Sweden	Cross-sectional Descriptives Structural equation modeling	"Support for innovation", 8 items (one of 4 dimensions of Team Climate Inventory [TCI], 38 items, 4 dimensions, Anderson and West)	• Team Climate Inventory (TCI), 38 items, 4 dimensions (Anderson and West) • Well-being (The anxiety-contentment scale, 6 adjectives; The depression enthusiasm scale, 6 adjectives) • Stress, measured by General Well-Being Questionnaire (GWBQ), 24 items, 2 scales	The perceived team climate has a significant positive correlation with wellbeing and a significant negative correlation with stress reactions. The structural equation modelling suggested that well-being is a mediating variable between team climate and stress.
King 2007[36]	24,205 respondents from 136 organizations (42.7%) Healthcare organizations United Kingdom	Cross-sectional Hierarchical regression analyses	Climate for innovation, 9 items (TCI + 1)	• Work demands, 7 items • Organizational performance, 7 dimensions ** *not asked on questionnaire; The ratings were made approximately 3 months after the survey data were collected as the culmination of a thorough review process*	Extending the job demands–resource model (Karasek, 1979), we predicted and found that among the sample of 22,696 respondents from 131 healthcare organizations, organizational climate for innovation alleviated the negative effects of work demands on organizational performance.

Lansisalmi 1999[35]	1767 employees and 108 work units divided into 4 samples (80-100%) 9 organizations from various sectors Finland	Cross-sectional Regression	Innovative climate, 4 or 5 items (adapted from the Organizational Health Survey, Phillips)	• Goal clarity, 3 items (Sawyer) • Feedback, 4 items (Stone) • Communication, 3 or 4 items (Phillips, KivimaÈ ki et al) • Autonomy, 1 item • (Ganster) • Occupational Stress Questionnaire, 1 item (adapted)	In multiple regression analyses, high stress was associated with poor innovative climate but did not moderate the effects of other correlates on innovativeness. The results were reproduced across different samples and different measures of the concepts and remained constant after the adjustment within samples for the respondent's demographics and type of organization (manufacturing vs service and private vs public).
Rashid 2020[32]	331 public healthcare officials (82.75%) Public hospitals Pakistan	Cross-sectional Structural equation modeling	Climate of innovation, 8 indicators (Anderson & West)	• Creative performance, 6 indicators • Climate of inclusion, 7 indicators, adapted (Mor-Barak & Cherin, Nishii)	Current research results create evidence that climate of inclusion has positive association with the creative performance ($\beta = 0.320$ and p value $<.01$). This finding depicted that the climate of inclusion has its impacts on creative performance and if the healthcare officials feel highly valued, the more creatively they will perform at the workplace. These findings on climate of inclusion and creative performance are also consistent with the previous empirical studies.
Roen 2018[34]	1161 staff from 175 nursing homes units (67.5%) 45 nursing homes in 29 municipalities in 4 Norwegian counties Norway	Cross-sectional Descriptives Multilevel linear regression	“Innovative climate”, 1 of 10 scales in General Nordic Questionnaire for Psychosocial and Social Factors at Work (QPSNordic), 32 items, 10 scales, adapted	• Job satisfaction, 1 question • Person-centered Care Assessment Tool, 13 items • Demographics • General Nordic Questionnaire for Psychosocial and Social Factors at Work (QPSNordic), 32 items, 10 scales, adapted • Organizational and structural factors in the nursing home unit, 5 items • Special Care Unit Environmental Quality Scale (SCUEQS),18 items, adapted	Higher levels of [Person Centered Care] PCC were associated with a greater job satisfaction, 3 years or more of health-related education, a lower level of quantitative demands and role conflict, a higher level of perception of mastery, empowering leadership, innovative climate and perception of group work, in addition to the type of unit and the physical environment in the NH unit designed for people with dementia. SCU and staff job satisfaction explained most of the variation in PCC.

Studies which measured Culture of Innovation using more than 1 instrument (n=8)

Author, year	Sample (Response rate) Setting	Study design Data analysis	Culture of innovation metric as part of an instrument	Other metrics	Findings from abstract
Acar 2012[23]	332 healthcare workers (response rate not reported) 65 Private hospitals Turkey	Cross-sectional Descriptives Regression	Organizational innovation, 18 items, 5 subcomponents Wang and Ahmed (2004) and Jansen et al (2006)	• Organizational Culture Assessment Instrument (OCAI), 2 dimensions • Business performance, number of items unknown	According to the descriptive statistics it is found out that the dominant organizational culture in the Turkish healthcare industry is Hierarchy and it is followed by Clan and Adhocracy cultures. On the other hand the most seen innovation type is Product innovation Behavioral and Marketing innovations.
Bunce 1995[10]	435 healthcare workers at $Time_1$ (28%); 281 respondents at $Time_2$ 64.8%); 148 respondents at $Time_3$ (52.7%) National Health Service United Kingdom	Repeated measures Regression Descriptives	"Support for Innovation", 8 items (part of West's 4-factor model of innovation = pre TCI) Propensity to innovate, 5 items Composite innovation score	• Vision, 1 question • Participative Safety, 5 items • Task Orientation, 3 items • Rule independence, 5 items • Intrinsic job motivation, 6 items	Personality factors were most consistent in predicting change in innovation, while perceptions of group climate did not significantly predict any additional variance in individual innovation. The results suggest that individual work role innovation may be due more to individual personality factors or creativity than to people's perceptions of the supportiveness or otherwise of their social environment.
Kim 2015[19]	347 nurses (response rate not reported) 6 general hospitals (>300 beds South Korea	Cross-sectional Descriptives Structural equation modeling	Individual innovative behaviors, 14 items, 5 subscales (Kleysen & Street) Innovative organizational culture, 5 items (Kwon)	• Self-leadership, 18 items, 6 subscales (Manz) • Individual knowledge sharing, 9 items (Bai and Lee) • Creative self-efficacy, 8 items (Carmeli and Schaubroeck)	Self-leadership, creative self-efficacy, and individual knowledge sharing directly affected individual innovative behaviors. Organizational knowledge sharing indirectly affected individual innovative behaviors, and this effect was mediated by an innovative organizational culture.

				• Organizational knowledge sharing, modified 5-item scale (Bai and Lee)	
Nazir 2018[12]	325 full time nurses (54%) 1 public sector hospital China	Cross-sectional Structural equation modeling	Innovative organizational culture, 5 items (O'Reilly) Innovative behavior, 6 items, single subscale (Scott & Bruce)	• Leader member exchange (LMX), 7 items • Perceived organization support (POS), 8 items • Tie strength, 3 items • Affective commitment, 6 items • Demographic characteristics, 4 items	Results from the structural equation modeling (SEM) analysis indicated that [Leader Member Exchange] LMX, tie strength, and [perceived organizational support] POS are significantly related to affective commitment and employees' IB [innovative behavior]. However, innovative organizational culture has a significant influence on POS and IB, but has no impact on affective commitment.
Nowak 2019[16]	71 emergency departments from which at least 2 employee responses and 1 executive response were obtained (response rate not reported) 119 hospitals United States	Cross-sectional Stepwise multivariate regression	Culture of innovation, 15 items (adapted from Anderson & West, Scott & Bruce)	• Clinical Outcome Index (COI), 5 subscales • Heterogeneous external networks, number of items unknown *adapted from prior research (Goerzen & Beamish, Powell) • Organizational characteristics, 7 items	The proposed model suggests a positive relationship between network heterogeneity and group-level performance. Furthermore, it proposes the positive moderating role of culture of innovation on the relationship between network heterogeneity and performance. Network heterogeneity of each emergency department was identified as an objective measure (as frequencies) of the department's external connections in 4 different geographical markets (m= 5:2, SD =2:4).
Sommez 2019[38]	332 nurses (100%) 2 public university hospitals Turkey	Cross-sectional Descriptives Linear regression	Climate of Innovation Scale, 22 items, 2 subscales Innovative behavior, 6 items, single subscale	• Supervisor Supportiveness Scale, 7 items (Jannsen) • Participant characteristics, 12 items • Dempster practice behavior scale, 15 items, 3 subscales (Dempster)	The model used for examining the mediating role of autonomy was found to be statistically significant, as it explained 36 percent of the variance of IB. When the significance of the mediating role was tested, its effect on both innovation climate and SS was observed to be significant.
Weng 2015[18]	439 nurses (97.55%)	Cross-sectional Descriptives	Innovation climate, 9 items (based on Sarros,	• Patient safety climate, 28 items, 4 dimensions • (Katz-Navon, Naveh)	The mean values of agreement of nurse innovation behaviour and transformational leadership were 3.40 and 3.78,

	3 hospitals Taiwan	Hierarchical regression	Dackert, and Wong and He) Nurse innovation behaviour, 9 items (based on Weng and Chang and Liu)	• Transformational leadership, 19 items, 4 subscales (Scandura & Williams, Sosik, Gowen) • Hospital support for staff, 3 items • Demographics, 8 items	respectively. Patient safety climate and innovation climate were found to have full mediating effects on the relationship between transformational leadership and innovation behaviour.
West 1991[39]	43 healthcare professionals (72%) 8 primary healthcare teams United Kingdom	Cross-sectional Descriptives Regression	Climate for innovation, 24 items, 5 subscales (Siegel and Kaemmerer) Total innovation score for each practice Role innovation score	• General biographical details, 6 items • Knowledge of results, 4 items (Hackman and Oldham) • Role ambiguity, 6 items (Rizzo, House and Lirtzman) • Commitment, 9 items, 3 components (Cook and Wall) • Group cohesiveness, 3 items (Seashore, Lawler, Morris and Commann) • Participation in decision-making, 5 items (adapted Ruh, White and Wood, Meadows) • Work discretion, 5 items (Alban-metcalf and Nicholson) • Team collaboration, 18 items, 3 dimensions (Aram, Morgan and Esbeck) • Peer leadership, 11 items, 4 subscales (Taylor and Bowers)	On the basis of these inventories, team innovativeness was rated by experienced health care professionals. Team innovation was predicted by climate for innovation (in particular tolerance of diversity), team commitment and team collaboration.

Studies which measured Culture of Innovation with "homegrown" instrument (n=2)

Author, year	Sample (Response rate) Setting	Study design Data analysis	Culture of innovation metric	Other metrics	Findings from abstract
Muñoz-van den Eynde 2015[21]	645 workers (10.18%) 1 public research organization,1 public university, and 1 healthcare company Spain	Cross-sectional Structural equation modeling	Radiography of Innovation Culture-Multidimensional Questionnaire (RIC-MQ), 16 questions, 3 dimensions		The RIC-MQ includes 3 dimensions: general, organizational and individual. Reliability, construct validity and discriminant validity results are satisfactory. The 3 dimensions structure has been confirmed and 15 factors have been identified.
Weng 2012[37]	808 nurses in 172 teams (76.3%) 4 hospitals Taiwan	Cross-sectional Descriptives Hierarchical linear modelling	Nursing innovation, 23 items, 3 dimensions (based on Smith, Hansen & Birkinshaw, Lovelace, Scott & Bruce, and Rogers)	Patient safety climate, 30 items, 4 dimensions (Katz-Navon, Naveh)	Of these 3 dimensions of nursing innovation, the level of knowledge creation was perceived by the nurses as the highest. In terms of patient safety climate, managerial practices regarding patient safety scored the highest, followed by patient safety procedures, patient safety information flow and patient safety priority. Only patient safety information flow yielded a significant positive influence on knowledge creation, innovation behaviour or innovation diffusion.

Studies which measured Organizational Culture (n=3)

Author, year	Sample (Response rate) Setting	Study design Data analysis	Organizational Culture metric	Other metrics	Findings from abstract
Büschgens 2013[3]	43 studies from 6341 organizations Various countries	Meta-analysis	Competing Values Model of Organizational Culture	N/A	This meta-analysis, which comprises 43 studies with a combined sample size of 6341 organizations, reveals that Quinn and Rohrbaugh's Competing Values Framework provides a meaningful structure for the ideational aspects of organizational culture...The analysis shows that the congruence of different cultures with organizational goals of innovation can be described based on that framework. The cumulative data confirms the hypothesis that managers of innovative organizations most likely implement a developmental culture, which emphasizes an external and a flexibility orientation. Yet also group and rational cultures are to a certain extent consistent with the goals of an innovative organization and may thus be appropriate social control strategies.
Chan 2008[50]	374 matched supervisor-subordinate dyads (80%) 5 healthcare homes, 1 information technology department of an education organization, 1 organization that	Cross-sectional Descriptives SEM	Competing Values Model of Organizational Culture, 8 items (Quinn and Spreitzer)	• Social structural factors, 26 items, 5 measures • Psychological empowerment, 12 items, 4 factor construct (Spreitzer) • Organizational citizenship behavior, 20 items (Podsakoff)	Results indicate that subordinates' trust for their supervisors fully mediates the relationship between information support, social political support and psychological empowerment. The relationship between resources support, human- and innovation-oriented organizational culture and psychological empowerment is partially mediated. Results also indicate that organizational citizenship behavior is a significant outcome of psychological empowerment.

	provides health services United States				
Mesfin 2020[22]	326 healthcare workers (88%) four primary hospitals Ethiopia	Cross-sectional Descriptives	Organizational culture assessment instrument (OCAI), 24 declarative items, 6 domains (Cameroon and Quinn)	• Socio-demographic characteristics • Job satisfaction, 36 items, 5 dimensions (Kavanaugh)	It was indicated from the finding that, the dominant existing organizational culture typology in the primary hospitals was Hierarchy culture (MS = 22.31, ±2.82).and the preferred organizational culture typology was Innovative culture (MS = 26.09, ±4.72). The health workers had low to medium level of job satisfaction where only (29.40%) of the health workers were very satisfied with their hospital physical working environment. Existing perceived clan culture had positive and significant correlation with health workers' satisfaction in relation to work relation dimension ($r = .16$, $p<0.002$).

APPENDIX G. CITATIONS FOR EXCLUDED PUBLICATIONS

Not healthcare (n=8)

1. Burch GSJ, Pavelis C, Port RL. Selecting for creativity and innovation: The relationship between the Innovation Potential Indicator and the Team Selection Inventory. *International Journal of Selection and Assessment.* 2008;16(2):177-181.

2. Fagerlind Stahl A-C, Gustavsson M, Karlsson N, Johansson G, Ekberg K. Lean production tools and decision latitude enable conditions for innovative learning in organizations: a multilevel analysis. *Applied ergonomics.* 2015;47:285-291.

3. Jaiswal NK, Dhar RL. Transformational leadership, innovation climate, creative self-efficacy and employee creativity: A multilevel study. *International Journal of Hospitality Management.* 2015;51:30-41.

4. Lee C-S, Chen Y-C, Tsui P-L, Yu T-H. Examining the relations between open innovation climate and job satisfaction with a PLS path model. *Quality & Quantity: International Journal of Methodology.* 2014;48(3):1705-1722.

5. Liu Y, Wang W, Chen D. Linking Ambidextrous Organizational Culture to Innovative Behavior: A Moderated Mediation Model of Psychological Empowerment and Transformational Leadership. *Frontiers in psychology.* 2019;10:2192.

6. Maher L, Plsek P, Bevan H. Creating the culture for innovation: a practical guide for leaders. NHS Institute for Innovation and Improvement; 2009.

7. Sanz-Valle R, Naranjo-Valencia JC, Jimenez-Jimenez D, Perez-Caballero L. Linking organizational learning with technical innovation and organizational culture. *Journal of Knowledge Management.* 2011;15(6):997-1015.

8. Wang P, Rode JC, Shi K, Luo Z, Chen W. A workgroup climate perspective on the relationships among transformational leadership, workgroup diversity, and employee creativity. *Group & Organization Management.* 2013;38(3):334-360.

Qualitative description/Commentary (n=5)

1. Black H, Fitzgerald A. Organisational Climate for Change And Innovativeness: A Social Capital Perspective. *Asia Pacific Journal of Health Management.* 2018;13(1).

2. Everett LQ, Sitterding MC. Building a culture of innovation by maximizing the role of the RN. *Nursing administration quarterly.* 2013;37(3):194-202.

3. Garney WR, Wilson K, Nelon JL, et al. Understanding innovation in health program planning and development. *Evaluation and program planning.* 2019;73:226-231.

4. Hagle M, Dwyer D, Gettrust L, Lusk D, Peterson K, Tennies S. Development and Implementation of a Model for Research, Evidence-Based Practice, Quality Improvement, and Innovation. *Journal of nursing care quality.* 2020;35(2):102-107.

5. West MA, Anderson N. Innovation, Cultural-Values, and the Management of Change in British Hospitals. *Work and Stress.* 1992;6(3):293-310.

Not culture of innovation (n=4)

1. Bonacci I, Cicellin M, Tamburis O, Galdiero C. "Smart" healthcare organizations. An analysis of the organizational climate in a Hospital Paediatrics ward. *Ifkad 2013: 8th International Forum on Knowledge Asset Dynamics: Smart Growth: Organizations, Cities and Communities*. Matera: Ikam-Inst Knowledge Asset Management; 2013:1040-1056.

2. Hermer L, Cornelison L, Kaup ML, Poey JL, Stone R, Doll G. The Kansas PEAK 2.0 Program Facilitates the Diffusion of Culture-Change Innovation to Unlikely Adopters. *The Gerontologist.* 2018;58(3):530-539.

3. Luz S, Shadmi E, Admi H, Peterfreund I, Drach-Zahavy A. Characteristics and behaviours of formal versus informal nurse champions and their relationship to innovation success. *Journal of Advanced Nursing.* 2019;75(1):85-95.

4. Marques CS, Valente S, Lages M. The influence of personal and organisational factors on entrepreneurship intention: An application in the health care sector. *Journal of nursing management.* 2018;26(6):696-706.

Unavailable (n=1)

1. Carlucci D, Mura M, Schiuma G. Fostering Employees' Innovative Work Behaviour in Healthcare Organisations. *International Journal of Innovation Management.* 2020;24(2).