Organizational Climate of Staff Working Conditions and Safety—An Integrative Model

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Abstract

Objectives: This project sought to compare measures of organizational climate in ongoing patient safety studies, identify similarities and setting-specific dimensions, develop a model of climate domains that are hypothesized to affect outcomes across settings, and test aspects of the model. **Methods**: Investigators who had surveyed health care workers' perceptions of organizational climate in six studies funded by the Agency for Healthcare Research and Quality (AHRQ) were invited to participate. Survey items from each study were classified using four climate domains found in a prior literature review. The authors discussed subconstructs, proposed additional constructs, developed an integrative model, and independently tested selected aspects of the model. **Results**: The investigators who participated had studied acute care, home health care, long-term care, and multiple settings; two investigators had studied primary care. More than 80,000 workers were surveyed. The model's core climate domains included leadership (e.g., values) and organizational structural characteristics (e.g., communication processes and information technology), the impact of which was mediated by four process variables: supervision, group behavior (e.g., collaboration), quality emphasis (e.g., patient centeredness), and work design (e.g., staffing). These factors affect health care worker outcomes (e.g., satisfaction and intention to leave) and patient outcomes. Overall, the full model explained 24 to 65 percent of the variance in employee satisfaction, but was not as effective at predicting intention to leave. **Conclusions:** While some of these domains appeared in prior models, new domains—quality emphasis, new subconstructs, information technology, and patient centeredness—are emerging. Our model invites dialogue among researchers and informs agenda-setting for future research into organizational climate and the safety of patients and health care employees. This integrative model will facilitate cross-study quantification of associations among variables in these important domains.

Introduction

Three recent reports by the Institute of Medicine (IOM) identified major safety and quality problems in American health care and drew attention to system-level sources of these problems.[1–3] As the authors of *Crossing the Quality Chasm* stated, "Threats to patient safety are the end result of complex causes … The way to improve safety is to learn about causes of error and use this knowledge to

design systems of care so as to … make errors less common and less harmful when they do occur."[2] As a result, researchers, policymakers, and health care providers have intensified their efforts to understand and change organizational conditions, components, and processes of health care systems as they relate to safety.

Research studies in health care, along with findings from other industries, point to a wide range of organizational conditions and work processes that may shape the performance of health care practitioners and provider organizations.[4–10] Despite the difficulty in implementing far-reaching organizational change, some health providers have succeeded in restructuring their organizations in ways that promote quality health care.[11–14] Within this growing body of evidence, researchers have sought to understand the influence of organizational culture and climate on health care quality.

Organizational climate refers to member *perceptions* of organizational features like decisionmaking, leadership, and norms about work. Organizational culture refers more broadly to the norms, values, beliefs, and assumptions shared by members of an organization or a distinctive subculture within an organization.[15, 16] In the past two decades, many studies of organizational culture have used standardized questionnaires and cultural inventories, which rely on members' perceptions and reports of cultural features.[17–19] Some of these standardized culture inventories are quite close to the instruments originally developed for climate studies. Moreover, researchers have sometimes used the terms "culture" and "climate" interchangeably.

Gradually, evidence is accumulating that links culture and climate to behavior, attitudes, and motivations among clinicians. These behaviors and orientations can, in turn, affect quality processes and outcomes. Many studies outside of health care settings and a growing number of studies in health care, show that employees have more job satisfaction and experience less stress and burnout when they work in cultures and climates that have supportive and empowering leadership and organizational arrangements, along with positive group environments (often reflecting elements of group support, collaboration, and consensus).[20–24] Furthermore, employee satisfaction and commitment have repeatedly been found to reduce absenteeism and turnover intentions.[20, 24–26] These findings contain important implications for health care management. For example, nursing staffs are more likely to be satisfied, committed, and stable in health care organizations that support and empower nurses.[1] A more satisfied and stable nursing staff may more readily contribute to patient satisfaction, help reduce errors, and assist in the implementation of other steps toward improving health care quality.[21, 27] Studies outside health care also link satisfaction and commitment to individual performance and other forms of organizationally constructive behavior.[23, 24]

A smaller group of studies explores direct links between culture or climate and behaviors or outcomes that are related to quality. The dependent variables in these studies include employee absenteeism, implementation of evidence-based care management practices, patient satisfaction, and performance.[28–31] However, solid evidence showing direct impacts of organizational culture or climate on

clinical and system outcomes is sparse.[33] Important exceptions include findings of a positive association between a teamwork-oriented culture and patient satisfaction in Veterans Health Administration hospitals.[30] Moreover, Clark et al, report that hospital nurses from units with low staffing and poor organizational climates (in terms of resources and leadership) were twice as likely as nurses on well-staffed and better-organized units to report risk factors, needlestick injuries, and near misses.[33] In instances where culture and climate do not independently predict clinical and organizational outcomes, they may still act as important mediating or contextual factors.[29, 34, 35] For example, in Canadian long-term care facilities, a culture that supports organizational learning and employee development was found to be a necessary condition for quality improvement programs to achieve their organizational objectives.[27]

Quantitative studies of organizational culture, such as those reported above, often have drawn on either typological or dimensional models.[19] Typological models seek to classify entire organizational cultures in terms of a dominant value or normative orientation. For example, the competing values framework classifies organizations as predominantly oriented toward internal cohesiveness and human relations development, creativity and innovation, order and predictability, or competitiveness and goal attainment.[36] Shortell and his colleagues adopted this model to the cultures of medical organizations by characterizing the respective cultural types as group, hierarchical, developmental, or rational in their orientations.[29, 32] Typological models assume that entire cultures can be characterized in terms of an overarching substantive theme. In contrast, dimensional models, including some derived from the competing values framework, allow for the possibility of internal variations along separate, conceptually defined orientations.[37] For example, Kralewski, Wingert and Barbouche developed an instrument for assessing emphasis by members of medical group practices on each of nine dimensions—innovativeness, group solidarity, cost-effectiveness orientation, organizational formality, method of cost control, centralization of decisionmaking, entrepreneurism, physician individuality, and visibility of costs.[38]

Unfortunately, lack of consensus on the key dimensions and subconstructs for assessing culture and climate has slowed the accumulation of evidence about how norms, values, and perceptions affect patient safety and other aspects of quality of care. Investigators in and out of health care have used a very wide variety of definitions, concepts, measures, and methods to study culture and climate.[17, 24, 31, 39–41] Although this broad mix of measures and definitions reflects the complexity of the phenomena under study, lack of definitional and methodological consistency makes it hard to generalize across studies and develop evidence-based implications for practice.

This paper reports an effort to help bring order and consistency to this line of research. In it we develop and test a model of organizational climate in health care across diverse delivery settings. We focus on organizational climate for a number of reasons. First, organizational climate features may be more amenable to change than deep-rooted cultural assumptions and values. Second, the focus on

organizational climate, rather than culture, may provide for a better logical fit between concepts and questionnaire measures than sometimes occurs in quantitative culture inventories; it seems quite logical that members of an organization will be aware of their perceptions of organizational conditions (climate) and will be able to report these perceptions accurately in closed-ended questions. In contrast, members are less likely to be fully cognizant of shared norms, values, and basic assumptions, and may face difficulties in characterizing such complex phenomena in their responses to fixed-choice questions.[42–44] Lastly, we focus on facets of organizational climate that are particularly relevant to care providers, health managers, and decisionmakers.

This project resulted from an initiative by the Agency for Healthcare Research and Quality (AHRQ) targeting the health care workforce and patient safety (RFA HS01-005). AHRQ sponsored a number of working groups, one of which focused on working conditions and organizational climate. This working group held a number of conference calls over a 3-year period to discuss issues developing at AHRQ, provide an open exchange of ideas regarding the measurement of organizational climate across health care settings and its relationship to patient safety, and develop synergy among grantees. Investigators involved in this forum were invited to participate in this project if they were part of a study team that had surveyed health care worker perceptions of organizational climate. Based on a prior literature review and input from the various investigators, the group discussed conceptual domains and subconstructs of organizational climate related to perceived working conditions and its relationship to health care worker safety and patient safety.[18] An integrative conceptual model of organizational climate was developed by seeking consensus among participants about empirically and theoretically important constructs.

The integrative model

The integrative model is presented in Figure 1. The model's core climate domains include leadership and organizational structural characteristics. Subconstructs of leadership include organizational values, as well as style and strategies used by top management. The subconstructs associated with organizational structural characteristics include formal communication processes, governance structures, and information technology infrastructure. The direct impact of these variables on patient and health care worker outcomes is mediated by four process domains: (1) supervision, (2) group behavior, (3) quality emphasis, and (4) work design. This model distinguishes between leadership and supervision. Supervision refers to the direct managers' style or the recognition an employee receives on a daily basis. Work design includes five subconstructs: (1) manageable workload, (2) resources and training, (3) rewards (defined as monetary compensation such as salary and bonuses), (4) autonomy, and (5) employee safety. Group behavior includes two subconstructs—collaboration and consensus (the latter including items such as "there is general agreement on treatment methods"). Subconstructs associated with quality emphasis include patient centeredness, patient safety, innovation, outcome measurement, and

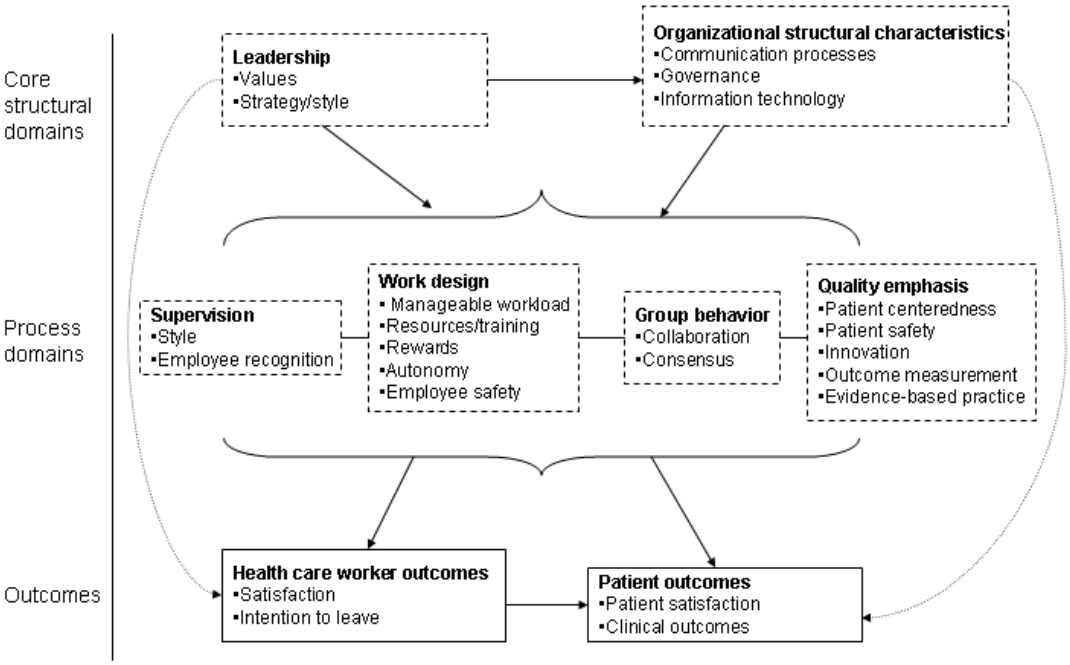
evidence-based practice. The four process domains influence worker outcomes and patient outcomes. Finally, worker outcomes are expected to impact upon patient outcomes.

Methods of validating the model

Although each research team initially conceptualized key relationships among organizational elements and performance differently, all participating investigative teams sought to understand essential elements of climate. Therefore, each investigator provided the health care worker survey items currently being used in their separate ongoing research projects. An item-by-item analysis of all surveys was conducted by two of the authors (PS and MH). In this process, the original climate scales were decomposed, and each item was theoretically classified using the developed integrative model into the best-fitting domain and/or subconstruct in the integrative model. For example, items classified as measuring supervision style include "I feel that I am supervised more closely than is necessary," and "a supervisory staff that is supportive of nurses." A copy of all final scales is available from the corresponding author.

Reliability statistics (Cronbach's alpha) of scales were examined and items were dropped as necessary to develop the most stable measures possible of the theoretical concepts. Scales that were unstable were dropped from further model

Figure 1. An integrative model of health care working conditions on organizational climate and safety



Boxes outlined with dotted lines represent domains of organizational climate. Boxes outlined with solid lines represent outcomes. Core domains are in bold. Subconstructs are bulleted underneath. The dotted arrows connecting core structural domains represent direct effects on outcomes, which are mediated by the process domains.

testing. All projects were tested for multicollinearity among scales using pairwise Pearson correlation between scales. Four of the studies found no correlations that exceeded a cutoff limit of $r \geq 0.60$. Two research teams found a correlation over 0.60, and each eliminated one of the pair on this basis. Additionally, one study examined the collinearity diagnostics included in Statistical Package for the Social Sciences (SPSS) 11.5 and found levels of collinearity high enough to affect the models. One scale, with the highest variance inflation factor (VIF), was eliminated before the final modeling steps. Final models for all studies were thus free of collinearity levels that would affect model stability.

Because the participating investigators were supplying data from ongoing, AHRQ-funded patient safety projects, many of the investigators were still in the process of data collection. Therefore, data on the primary outcome of patient safety were often not available. Instead, the group members decided to validate the model using the most common health care worker outcomes found across studies, which were employee satisfaction and intention to leave.

To test different aspects of the model, each investigative team conducted a series of similar analyses. First, linear regressions were conducted to investigate the relationship among the core climate subconstructs of leadership and organizational structural characteristics. Second, to understand the relationship among the core climate domains and the four process domains—supervision, group behavior, quality emphasis, and work design—linear regressions were conducted using the core domains as the predictor variables and the process domains as the dependent variables. Third, linear regressions were conducted using core domains as the independent variables and health care worker outcome measures as the dependent variables. Finally, investigators tested the independent effects of each process subconstruct on health care worker outcomes, controlling for the core domains using multivariate stepwise regressions. In these models, the core climate subconstructs associated with leadership and organizational structural characteristics were entered as the first block of independent variables. Then, the subconstructs associated with the four process domains (supervision, group behavior, quality emphasis, and work design) were entered as a second block of independent variables. When investigators found that employee demographics predicted these outcomes, the demographic variables were statistically controlled for. It was hypothesized that the independent variables would be positively related to satisfaction and negatively related to intention to leave.

There was slight necessary variation in the means used by the investigative teams to conduct their regressions, due to the nature of secondary data analysis. Most investigative teams used the subconstructs described as the independent variables. However, one investigative team combined the subconstructs into overall organizational climate domains. In another study, intention to leave was measured as a dichotomous variable, and therefore, a logistic regression was conducted in a fashion similar to that of the linear regressions.

Results

Demographics of participating studies

The six participating investigative teams represent individual studies conducted across the nation in the following health care settings: acute care (n = 1), home health care (n = 1), long-term care (n = 1), primary care settings (n = 2), and multiple settings (n = 1). More than 80,000 health care workers were surveyed in these projects, and employee demographics surveyed by each investigative team are described in Table 1. Diverse job categories ranging from certified nursing assistants to hospital administrators and medical assistants to primary care providers are represented, with the largest sample associated with a multisite study conducted through the Veterans Health Administration. The surveys used by each investigative team vary.

Table 1. Description of samples and surveys from each independent project

	Study					
Characteristic	**1**	**2**	**3**	**4**	**5**	**6**
Description	Home care	General medicine and family medicine practices	Primary care teams	Multiple settings across VHA facilities	32 Colorado nursing homes	109 intensive care units
Description of sample	Nonclinicians (M) and clinicians (RN, T)	Clinicians (MD)	Nonclinicians (R, S) and clinicians (LPN, MD, MA, NP, PA, RN)	Nonclinicians (U) and clinicians (U)	Nonclinicians (U) and clinicians (CNA, RN, LPN)	Clinicians (RN)
Final sample size	952	420	600	74,595	1,763	2,324
Number of items in survey	99	31	18	29	52	59

VHA = Veterans Health Administration
Nonclinicians include managers (M), receptionists (R), staff (S), and unspecified (U).
Clinicians include certified nursing assistant (CNA), licensed practical nurse (LPN), medical assistant (MA), medical doctor (MD), nurse practitioner (NP), physician assistant (PA), registered nurse (RN), therapist (T), and unspecified (U).

Results of empirical testing of the model

The number of applicable items per domain and the reliability of the newly developed scales from each study are reported in Table 2. All investigative teams, except that involved with Study 2, were able to develop relatively stable scales at the subconstruct level. All studies, except that involved with Study 3, had some type of measure related to the core organizational climate domains. The "information technology" subconstruct was not represented by an independent measure in any investigation; however, related items were found in Study 2's

Table 2. Reliability of measures

Study	1	2	3	4	5	6
Core organizational climate domains						
Leadership	-	2 (.69)	-	-	-	-
Values	-	-	-	1	-	2 (.66)
Strategy/style	-	-	-	1	6 (.78)	-
Organizational structural characteristics	-	7 (.76)	-	-	-	-
Communication processes	9 (.90)	-	-	-	3 (.70)	2 (.47)†
Governance	-	-	-	2 (.74)	2 (.49)†	4 (.71)
Information technology	-	-	-	-	-	-
Organizational climate process domains						
Supervision	-	-	-	-	-	-
Style	7 (.88)	-	-	4 (.78)	1	4 (.86)
Employee recognition	-	-	-	2 (.70)	-	2 (.71)
Work design	-	1	-	-	-	-
Manageable workload	5 (.75)	-	-	-	-	7 (.72)
Resources/training	7 (.89)	-	6 (.74)	2 (.58)†	1	5 (.73)
Rewards	4 (.77)	-	-	-	-	-
Autonomy	9 (.82)	-	7 (.82)	-	3 (.24)†	-
Employee safety	-	-	-	-	-	-
Group behavior	-	9 (.79)	-	-	-	-
Collaboration	12 (.89)	-	3 (.83)	1	6 (.86) *	3 (.87)
Consensus/harmony	-	-	-	4 (.74)	4 (.78)	-
Quality emphasis	-	10 (.81)	-	-	-	-
Patient centeredness	1	-	2 (.73)	3 (.82)	-	-
Patient safety	15 (.87)	-	-	-	-	-
Innovation	-	-	-	2 (.79)	-	-
Outcome measurement	-	-	-	2 (.68)	-	-
Evidence-based practice	-	-	-	-	1	-
Health care worker outcomes						
Satisfaction	12 (.90)	5 (.86)	6 (.87)	4 (.77)	-	1
Intention to leave	1	1	0	1	1	1

Note: Each numeral represents of the number of items in the measure. In parentheses is the Cronbach's alpha (α) of the scale. Dash (-) represents domain or subconstruct not measured.
*This investigative team had 4 individual scales on collaboration; the number of items and α for scale 1 is reported in the table. Scale 2 contained 6 items (.80); scale 3 contained 5 items (.80); scale 4 contained 4 items (.69).
† Indicates a figure with a Cronbach's alpha score below the acceptable level ($r \geq 0.60$).

organizational structural characteristic scale. Processes related to direct supervision were measured in four of the studies; however, Study 5 had only one item in this category. All studies had some measure of work design, with resources and/or training being the most commonly measured subconstruct. All studies had some measure of group behavior, and most measured collaboration (five out of six studies). Study 5, which was conducted in a long-term care setting, had four separate stable scales of collaboration. Most studies (four of six) had stable measures of quality emphasis, while Study 5 had a single-item measure. Employee satisfaction and intention to leave were commonly measured across studies. Study 6 had a single item related to satisfaction, while the other five studies had multi-item scales available to measure employee satisfaction. Also in Study 6, the measure of intention to leave was dichotomous, compared to the other four studies, which had one-item, continuous-level variables.

As predicted, the regression analyses within the separate studies showed there was a strong relationship among the core climate subconstructs of leadership and organizational structural characteristics. This analysis was not applicable to Study 3, due to the lack of measurement of core domains. In the other five studies, the leadership domain or one of its subconstructs significantly ($P \leq 0.05$) predicted measures of organizational structural characteristics; the variance explained ranged from 24 to 54 percent. The two core domains also significantly predicted to constructs within the four process domains. Although the number of process variables varied among the studies, in nearly every case the core domains or their subconstructs had statistically significant predictions of the process variables. The core domains also had strong direct effects on the outcome variables. Twenty to 34 percent of the variance in employee satisfaction and 8 to 10 percent of the variance in intention to leave was explained by the core domains.

Five of the investigative teams were able to conduct the multivariate stepwise regressions predicting satisfaction (Table 3). Many of the core organizational climate domains or subconstructs (five of eight) continued to have statistically significant ($P < 0.05$) independent effects on satisfaction. In addition, most of the process domains or subconstructs (25 of 30) had significant independent effects on satisfaction. Overall, the full model explained 24 to 65 percent of the variance in employee satisfaction.

Results from the multivariate stepwise regressions predicting intention to leave are displayed in Table 4. While the direction of the relationships were as predicted and negative perceptions of organizational climate predicted intention to leave, only three of the six leadership items had a statistically significant independent effect on intention to leave, and none of the organizational structural characteristics (n = 5) was an independent significant predictor. Of the process domains and subconstructs, supervision had the most consistent independent significant effect on intention to leave. Overall, the model explained 8 to 23 percent of the variance in intention to leave.

Discussion

This paper presents a model of organizational climate, which encompasses variables and concepts found in six independent studies. These studies were conducted across a broad range of settings and surveyed a wide range of health care workers. We present a preliminary empirical validation of the model by reporting conceptually plausible associations among the model's domains and showing that variables from these domains predict employee satisfaction and turnover intention in ways that are consistent with previous research. Across studies, similar patterns of relationships were found. Moreover, the full model was a better predictor of the outcome variables than were the elements within the model.

As might have been anticipated from the literature, the climate measures predicted satisfaction more strongly and more consistently than they predicted turnover intention. Turnover intentions are subject to many influences exogenous

Table 3. Results of multivariate regressions predicting employee satisfaction

Study	1*	2	3	4*	6
Core organizational climate domains					
Leadership	-	0.14†	-	-	-
Values	-	-	-	n.s.	0.05‡
Strategy/style	-	-	-	0.05†	-
Organizational structural characteristics	-	0.15†	-	-	-
Communication processes	n.s.		-	-	n.s.
Governance	-	-	-	-	0.41‡
Information technology	-	-	-	-	-
Organizational climate process domains					
Supervision	-	-	-	-	-
Style	0.09‡	-	-	0.06†	0.67 ‡
Employee recognition	-	-	-	0.04†	n.s.
Work design	-	n.s.	-	-	-
Manageable workload	0.30‡	-	-	0.04†	0.04 ‡
Resources/training	0.22‡	-	0.38†	0.09†	0.06 ‡
Rewards	0.13‡	-	-	0.05†	-
Employee safety	-	-	-	0.07†	-
Autonomy	0.07‡	-	-	0.14†	-
Group behavior	-	0.27 ‡	-		-
Collaboration	0.12‡	-	0.29†	0.09†	n.s.
Consensus/harmony	-	-	-	0.05†	-
Quality emphasis	-	n.s.	-	-	-
Patient centeredness	-	-	0.13†	0.31†	-
Patient safety	0.16‡	-	-	-	-
Innovation	-	-	-	n.s.	-
Outcome measurement	-	-	-	0.06†	-
Evidence-based practice	-	-	-	-	-
R^2	0.57	0.24	0.40	0.58	0.65

Note: Dash (-) represents subconstruct not measured and/or scale not stable enough to be included in model; n.s. equals not significant results; other results reported are standardized beta coefficients.
*Models adjusted for age, race, and/or gender.
† $P \leq 0.01$, ‡ $P \leq 0.001$

to the realm of climate, such as labor market conditions, assessments of employability, family status, and career stage.[45]

The most important contribution of this study is its climate domains and subconstructs, which can provide the basis for future studies in health care settings. The use of this model in future research will promote consistency across settings and studies, thereby facilitating an accumulation of research findings and evidence-based recommendations. Further development of operational definitions and generalizable measures applicable to the model is warranted and invited.

An additional contribution of the model lies in its elaboration of subconstructs within the domain of organizational structure; these are particularly important for research on patient safety and health care quality. Information technology, for example, is an increasingly prominent feature of organizational structure, which holds substantial promise for health quality.[46] Perceptions of the uses of information technology in health care organizations may affect the ways that clinicians respond to information technology innovations.[47] Hence, technology

Table 4. Results of multivariate regressions with intention to leave as dependent variable

Study	1*	2	4*	5*	6†
Core organizational climate domains					
Leadership	-	-0.13	-	-	-
Values	-	-	-0.03	-0.12	n.s.
Strategy/style	-	-	n.s.	n.s.	-
Organizational structural characteristics	-	n.s.	-	-	-
Communication processes	n.s.	-	-	n.s.	n.s.
Governance	-	-	-	-	n.s.
Information technology	-	-	-	-	-
Process organizational climate domains					
Supervision		-	-	-	-
Style	-0.09	-	-0.08	n.s.	1.1
Employee recognition	-	-	-0.02	-	n.s.
Work design	-	n.s.	-	-	-
Manageable workload	-0.13	-	-0.06	-	n.s.
Resources/training	n.s.	-	n.s.	n.s.	n.s.
Rewards	n.s.	-	-0.01	-	-
Autonomy	-	-	-0.06	-	-
Employee safety	-0.83	-	-	-	-
Group behavior	-	-0.15	-	-	-
Collaboration	-0.10	-	-0.04	-0.53‡	n.s.
Consensus/harmony	-	-	n.s.	n.s.	-
Quality emphasis	-	n.s.	-	-	-
Patient centeredness	-	-	-0.12	-	-
Safety	n.s.	-	-	-	-
Innovation	-	-	n.s.	-	-
Outcome measurement	-	-	-0.02	-	-
Evidence-based practice	-	-	-	n.s.	-
R^2	0.18	0.08	0.15	0.23	-

Note: n.s. equals not significant standardized beta coefficients or odds ratios. Dash (-) represents subconstruct not measured and/or scale not stable enough to be included in model. All coefficients and odds ratio reported in table are statistically significant ($P \leq 0.05$).

*Models adjusted for age, gender, and/or race.

† Intention to leave was a dichotomous variable in this study. Therefore, the results from this investigative team are based on a logistic regression, and odds ratios are presented.

‡Investigative team had 4 individual scales on collaboration; standardized beta coefficients for scale 1 is reported in table. The standardized beta coefficient for scale 2 was -0.14, for scale 3 it was not significant, and for scale 4 it was -0.19.

perceptions are likely to mediate between the introduction of information technologies and their outcomes. Because of its importance, we included the technology climate in our model, even though it was not well represented in our original research studies.

Our model also calls attention to the importance of the climate for quality, which we labeled "quality emphasis." Our model specifies the climate for quality as including the degree to which the delivery organization's climate is patient-centered, encourages safety awareness and practices, fosters innovation, and sustains the use of evidence-based medicine. As other researchers have suggested, there may be multiple climates within an organization in areas such as safety, service, or innovation.[35–48] These substantive climates are likely to affect closely related attitudes and behaviors even more powerfully than abstract climate

features such as cohesion or climate strength.[29] Only 2 of the 13 instruments for assessing culture and climate cited in a recent review contain measures related to quality climate, and none refers explicitly to an information technology climate.[19, 49]

Due to divergent climate measures in the six studies reported here, the validity and generalizability of our findings may be limited. Additionally, although this project is an exemplar of collaboration and resulting synergy, the separate investigative teams were not yet ready to pool the data into a single database that would be amenable to analysis through structural equation modeling. Although we have explored linear relations between climate and other variables, researchers would be well advised to look closely at nonlinear and noncausal relations. For example, very negative climates might affect performance, while other climates do not. In addition, climate may act as a contextual or mediating variable, rather than a direct cause of important outcomes. Finally, two scales constructed in these secondary analyses had lower Cronbach's alphas than often considered desirable.

Given the multileveled and multidimensional nature of organizational climate, the search for a single instrument—or even a single methodology—is not always wise.[19, 44] If an organization is considering the implementation of a new computerized order entry system, for example, investigators may need to understand only the employees' perception of information technology and innovation, not leadership values and styles of supervision. Nonetheless, some of the measures within our core set of concepts of organizational climate in health care settings are likely to be applicable to a range of health delivery settings. Moreover, they may be shown to possess sufficient predictive validity to justify their routine inclusion in investigations of the causes of outcomes like patient safety.

Implications for policy and practice

Development and validation of a core set of concepts and measures for studying climate in health care will permit comparisons across delivery settings and facilitate development of evidence-based recommendations about human resource management and organizational design within health services settings. Databases containing climate measures are already in use in some systems, like Kaiser Permanente.[50] Moreover, many acute care hospitals are contributing data to the National Database of Nursing Quality Indicators (NDNQI), which has adapted measures of nurse perceptions regarding work environment and job satisfaction.[51] Outside of health care, many government agencies use standardized climate assessments for benchmarking purposes.[52] Adoption of standardized climate tools and the creation of databases that support analyses at various organizational levels will help health care managers to better track their organization's progress through time, assess impacts of organizational and technological changes, and compare the climate in their unit or organization with those in comparable organizational settings.

It is our hope that the model presented here will encourage researchers to further refine this core set of concepts and develop standard measures for studying

climate in health care as it relates to safety. Standardization of climate measures will aid in the development of evidence-based recommendations for health services organization and human resource management within health delivery settings and perhaps facilitate the ultimate goal of turning results into evidence-based management practices. The model needs further testing using patient safety as the primary outcome to aid in this process.

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