

Safety Climate on Hospital Units: A New Measure

Mary A. Blegen, Ginette A. Pepper, Joseph Rosse

Abstract

Objectives: The purpose of this project was to create a measure of safety climate for hospital inpatient care units and to determine the psychometric properties of the measure. **Methods:** The first version of the measure was derived from published literature. Two rounds of expert review refined that measure. The measure was then pilot tested with 213 RN staff nurses working on 19 units in two hospitals, and administered a second time in one of those hospitals. **Results:** The Hospital Unit Safety Climate measure contains 33 items measuring 7 dimensions of safety climate. Internal consistency reliability was acceptable for the new measure. This measure has content validity and initial construct validity as indicated by factor analysis and comparative analysis. Early evidence suggests sensitivity and responsiveness. **Conclusions:** This safety climate measure is a strong alternative to the tools currently available for projects focusing on safety in inpatient units in acute care hospitals. The measure is being used in a national sample of hospitals participating in a study of the working conditions that affect medication accuracy.

Introduction

A great deal of work has been done in the last five years following the wide recognition of the threats to health care patient safety.¹ While consensus of opinions can be transitory, recommendations for change and improvement currently fall into one of three categories: technology, working conditions or the organization of work, and the culture or climate in health care organizations. The work reported in this article addresses the third category.

While there are established organizational culture measures available and while several safety culture measures have been developed recently, we sought to create a new, specific, safety climate measure in our study of the impact of working conditions of nurses on medication administration accuracy and adverse drug event prevention. The measure that we needed for our study had to indicate safety climate on patient care units in acute care hospitals. In addition, the measure needed to address factors that influence medication accuracy, minimize respondent burden (in order to encourage strong response rates), and quantitatively distinguish units and hospitals participating in the study. In 2001, when we were planning the study, there were no published measures of patient care unit safety climate; therefore, one of the specific aims for our study was to develop a measure by (a) elaborating from previous and ongoing studies and from the existing literature a measure of unit climate related to medication safety, and

Report Documentation Page

Form Approved
OMB No. 0704-0188

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE 2005	2. REPORT TYPE N/A	3. DATES COVERED -			
4. TITLE AND SUBTITLE Safety Climate on Hospital Units: A New Measure		5a. CONTRACT NUMBER			
		5b. GRANT NUMBER			
		5c. PROGRAM ELEMENT NUMBER			
6. AUTHOR(S)		5d. PROJECT NUMBER			
		5e. TASK NUMBER			
		5f. WORK UNIT NUMBER			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Agency for Healthcare Research and Quality 540 Gaither Road, Suite 2000 Rockville, MD 20850		8. PERFORMING ORGANIZATION REPORT NUMBER			
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSOR/MONITOR'S ACRONYM(S)			
		11. SPONSOR/MONITOR'S REPORT NUMBER(S)			
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release, distribution unlimited					
13. SUPPLEMENTARY NOTES Published in Advances in Patient Safety: From Research to Implementation. Volumes 1-4, AHRQ Publication Nos. 050021 (1-4). February 2005. Agency for Healthcare Research and Quality, Rockville, MD. http://www.ahrq.gov/qual/advances/.					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UU	18. NUMBER OF PAGES 16	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

(b) pre-testing the measure, modifying as needed, and determining the reliability and validity of the instrument. This article describes the process we used to develop the Hospital Unit Safety Climate measure, the results of the pilot test of the measure, and the results from the first use of the measure.

Organizational culture and organizational climate, while acknowledged to be similar concepts, are distinguished in the literature.²⁻⁵ Culture refers to a global phenomenon and encompasses the norms, values, and basic assumptions of an entire organization. Climate, on the other hand, is more specific and refers to the employees' perceptions of particular aspects of the organization's culture. Organizational culture was initially assessed inductively using qualitative ethnographic methods, although quantitative measures are now available. Climate has been assessed using deductive, positivistic, quantitative methods. Climate may be distinguished further as either an attribute of an individual employee (referred to as psychological climate) or an attribute of the work group (subgroups or the organization as a whole).^{6, 7} For this project, work group climate was the most applicable approach, with the work group defined as units within an acute care hospital.

Research on safety climate

Previous research on organizational climate for safety focused on worker safety in manufacturing industries and crew and passenger safety in the airline industry. The burgeoning interest in safety in health care focuses on patients. However, the safety of patients and airline passengers is different from the safety of workers in that the climate of safety that affects patients and airline passengers is largely outside their control. Thus, we are interested primarily in the effects on patient safety created by a climate of safety that emerges from health care providers and hospital staff. There have also been suggestions of linkages between worker health and safety and patient safety, and questions about organizational climate factors that may affect both.⁸

In manufacturing industries, worker safety is an important issue. Studies have identified a number of factors that affect the rate of worker injury. Dominant among those factors are the following:

- Supervisory systems and behaviors, including the individual supervisor's attitudes, actions, expectations, and communications.^{9, 10, 11}
- Inclusion of safety in the supervisor's position responsibilities.¹²
- Involvement of senior management and workers in safety issues.^{9, 12}
- The organization's commitment to safety and its willingness to assume responsibility and solve safety problems.^{10, 11, 12}
- The attitudes and behaviors of the workers themselves as influenced by the system.¹⁰

Research in two service organizations identified factors related to worker safety different from those identified in manufacturing organizations. These included maintenance and management issues, company policy, accountability, training and management attitudes, work environment, policy and procedures, and personal authority.¹³ There is research examining the climate of safety in health care as it impacts worker injuries, specifically exposures to blood borne pathogens.¹⁴ Six climate factors are reflected in Gershon et al.'s safety climate tool:

1. Management support for safety programs.
2. Absence of hindrances to safe work practices.
3. Availability of personal protective and engineering control equipment.
4. Minimal conflict and good communication among staff members.
5. Frequent feedback and training by supervisors.
6. Cleanliness and orderliness of the work site.

Safety in health care differs in some respects from safety in manufacturing. At the most obvious level, the person at the center of most safety discussions in health care is not the worker, but the recipient of services—the patient. The second major difference is the nature of the work and the worker in health care. Providers are not steps along an assembly line or cogs in a machine producing a product; they are professionals who apply knowledge, adapt learned procedures, and use judgment at each step of the care process. The professional work groups in aviation are more similar to health care work groups than are those in manufacturing. Important factors identified in aviation include attitudes toward safety, interpersonal communication among workers, teamwork and collaboration rather than hierarchical groups, and recognition of the risks inherent in fatigue and stress.^{15, 16}

Yet, the literature from manufacturing suggests important dimensions that should be considered in health care as well. The climate for safety in health care most likely does include the developed safety procedures, the reactions of supervisors, the training in use of technology, performance appraisals that include safety, pressures to perform efficiently, and physical work environment. Spencer reviewed the work from health care and non-health care settings and concluded that there is a safety culture that must be developed.¹⁷ Following Reason,¹⁸ he suggests that the health care safety culture should include adequate reporting systems, actions taken on the basis of the reports, flexibility, and learning from experience.

Threats to patient safety involve many aspects of health care; however, the threat from medication errors currently dominates most discussions. One of the central activities in medication safety involves nurse administration of

medications. Studies on safe medication administration have often focused on characteristics of individual nurses (i.e., experience level, education background, mathematical skills, knowledge level) rather than on systems or climate factors (e.g., O'Shea¹⁹). However, systems and climate factors can be extracted from existing work. Staffing levels and workload have been shown to affect medication safety.²⁰⁻²³ Continuously working with fewer nurses than needed may affect the climate on a unit by communicating the expectation that speed and efficiency are more important than cautious and careful following of procedures and professional standards for safe administration.

In a study of the perceptions of health care providers about reporting medication errors, several climate-like factors were apparent: being rejected or isolated by peers, being asked to publicly admit to the error, and having a copy of the incident report placed in the personnel file.²⁴ The respondents that experienced the negative responses reported they would be less likely to report a future error. Another recent study asked nurses and physicians to indicate factors that act as barriers to reporting medical errors.²⁵ Respondents indicated several climate-like factors such as fear of negative organizational response (e.g., blaming, disciplinary actions), fear of lawsuits, and doubt about the organization's use of the data reported.

Studies of nurses' perceptions of medication administration error reporting, the reasons that medication errors occurred, and the reasons they are not reported provide insight into safety climate in hospital inpatient units.^{26,27} Perceived reasons that medication errors occur included organizational factors such as workload demand, nurses floating between units, problems with delivery of medications from pharmacy, unclear physician orders, miscommunication among nurses, and lack of knowledge. Reasons that errors are not reported included fear of blame from administration, patients, and physicians; disagreement over definition of error; non-supportive administrative responses; and the effort of reporting. A recently completed survey of 1,105 hospital staff nurses directed respondents to select from a list the most common reasons that medication errors occur.²⁸ In addition to prescription and transcription errors, the four reasons most often selected referred to the environment or the system and included the following: distractions and interruptions, RN-to-patient ratio, wrong medication or wrong dose delivered to the unit, and volume of medications and patients.

Creating the Hospital Unit Safety Climate measure began with a review of the dimensions of safety climate from research literature about the manufacturing, service, and aviation industries. Potential safety climate dimensions were extracted from theoretical and empirical work in health care as well. The methods used in developing the safety climate measure and the results of each step in the process are presented in the order in which the measure was developed and refined. The steps we report here include:

- a. Initial conceptualization and operationalization through item writing.
- b. Two rounds of expert panel review with modifications between the steps.
- c. Pilot testing of the initial version of the measure.

- d. The first use of the final version of the measure.

Methods and results

To develop the safety climate measure, research team members first reviewed the dimensions and items drawn from the literature discussed above and supplemented these with professional experience. The team working to develop the measure included two nurse researchers with expertise in medication administration accuracy, nurse staffing, and working conditions; an organizational/ industrial psychologist; and four graduate student RNs with extensive working experience in acute care as direct care providers and as administrators/managers. A definition of safety climate that reflected the aspects pertinent to inpatient hospital units was created.

Safety climate was defined as the shared perceptions of work group members regarding the protection of patients from medication errors and injuries resulting from health care interventions and the environment. The perceptions include group norms for adherence to institutional and professional standards of care, the relative valuing of efficiency versus safety/quality, communication with others about safety practices, and accountability for safety. These perceptions arise from the following: interactions with peers, supervisors, and other health care providers; formal institutional policies and procedures; and informal enacted norms and values. These perceptions influence individuals' beliefs and actions when providing care and their willingness to engage in individual and joint activities to improve safety and quality.

Members of the research team individually wrote items for consideration. The goal at this step was to create both positively and negatively worded items as well as items that addressed each of the dimensions, each of several hospital levels (unit staff, supervisors/managers, administrators), and the multiple professions involved in medication safety (medicine, pharmacy, nursing). As these items were written and presented to the team, the definitions and dimensions were reviewed, critiqued, and modified to reflect our developing understanding. The team produced 186 items that were placed on a rating sheet. Each member of the team independently rated the items as to the dimension they best reflected. These ratings were analyzed to describe the consistency with which the team members placed items within dimensions. This task was completed twice with modifications in dimensions and items between ratings. Once items were placed in dimensions on which the team members agreed, the sets of items within each dimension were assessed for redundancy and length. Using iterative ratings and discussions, the research team produced an initial measure that contained 106 items across nine dimensions. Approximately 30 percent of the items in each dimension were worded negatively to minimize response set problems. Consistent with our focus on work group climate rather than worker psychological climate, items in all dimensions referred to the work group rather than the individual respondents' attitudes and behaviors.

The team reached consensus on nine dimensions of hospital unit safety climate:

- a. Adherence to standards of care.
- b. Technology, training, information.
- c. Full reporting of incidents.
- d. Communication about safety threats.
- e. Use of occurrence data for improvement.
- f. Emphasis on safety and quality.
- g. Causality of accidents and errors.
- h. Worker safety.
- i. Environmental safety.

The team recognized that the dimensions of worker and environmental safety are distinct from patient safety. However, following questions raised in recent articles about the possible linkage of patient and staff safety, we sought to determine whether worker and environmental safety were related to patient safety.

This 106-item version of the safety climate measure (10–14 items per dimension) was then sent to a panel of 43 experts who had agreed to review the measure. All members of the panel had some level of expertise in safety climate in health care or industry: 28 were nurse researchers or practicing nurses, 7 were pharmacists, 3 were physicians, and 5 were organizational/industrial psychologists. During the first round of the expert panel survey, panel members were asked to rate each of the nine dimensions as to its congruency with the safety climate definition and to make suggestions for modifying the definition and deleting or adding to the dimensions. Next, expert panel members rated each item as to its congruency with its assigned dimension and indicated whether the item was a positive or negative indicator of safety climate. A 91-percent response rate was achieved during the first round of expert review.

There were very few suggestions for the definition of safety climate and the dimensions. The congruency ratings for the dimensions were all above 4.0 on the 5-point scale. The lowest rating was 4.17 for the worker safety dimension, and the highest congruency score was 4.78 for the use occurrence data for improvement dimension. Experts rated the congruency of items within dimensions very high as well; ratings of items were all above 4 on the 5-point scale. The experts verified the negative and positive items and provided generous written comments and suggestions. In response to the expert panel feedback, more than half of the items were reworded, and a few were replaced with reviewer-suggested items.

Based on the ratings and comments of reviewers in round one, a revised 106-item version of the measure was sent to all 43 panel members for a second round of review. During the second round, the panel members were asked to indicate the usefulness of each item for measuring the presence or absence of safety climate

on a scale from 1 (not at all useful) to 5 (very useful). Panelists were not asked to evaluate the definitions and dimensions during the second round.

In this round, 27 members (63 percent of total panel, 69 percent of respondents from round one) returned rating sheets. Ratings of usefulness were more varied (3.69 to 4.81) than the ratings of dimensional congruency in round one. While still rating the items above the scale midpoint, expert panel ratings were helpful in identifying items to omit from the subscales. All items with mean ratings below 4 were omitted. Items with mean ratings between 4.0 and 4.25 were evaluated in light of the content and direction of the remaining items in order to select others for omission. Evaluative comments and suggestions were reviewed for ideas about improving item wording. Negatively worded items tended to be rated lower than positively worded items. In keeping with our goal of having a substantial subset of negatively worded items, we retained enough of these items to meet that goal.

On the basis of the expert panel review, the pilot version of the questionnaire was created. The items from all dimensions (74 items, 8–9 per dimension, 25 percent negatively worded) were combined and presented in a paper-and-pencil format to staff nurse RNs working on 19 units in two hospitals conveniently located near the research team. The questionnaire presented a brief definition of safety climate and asked the respondents to indicate their agreement (1–5, strongly disagree to strongly agree) that each “statement characterized the Safety Climate on my unit or in this hospital.” Useable questionnaires were received from 213 of these respondents (30 percent response rate). Hospital communication systems were used to remind staff nurses to return questionnaires, but second copies were not distributed.

Analyses were done with responses from staff nurses working on inpatient units ($N = 190$, 92 from hospital A and 98 from hospital B). These hospitals were similar in size. One of them was a private for-profit, and one was a not-for-profit teaching hospital. The nurse respondents worked on 15 units (range of respondents per unit was 4–31). The largest proportion of respondents worked on ICU units, and the second largest proportion worked on general medical surgical units. In similar proportions to the populations of nurses in these hospitals, 93 percent were female, 94 percent were Caucasian, and 49 percent had completed at least a baccalaureate degree. Only 11 percent were agency or traveling nurses; 47 percent worked the day shift; and 81 percent worked 12 hours shifts. Nurse respondents averaged 39 years of age, worked an average of 34 hours each week, had 14 years of experience working as a nurse, and averaged 6.5 years experience on the unit.

Initial analyses included determining the internal consistency of the dimensional subscales in the pilot version of the measure. In addition to describing the psychometric properties, the primary goal of the analysis of the pilot study data was to reduce the number of items. Reliability coefficients (Cronbach alphas) for the subscales were acceptable (0.69–0.82). Particular attention was paid to the item-to-total correlations and the potential responsiveness of each item (item means are not extremely high or low with

sufficient variability to detect differences). Only 10 items could be identified for omission from the 9 dimensions on the basis of these criteria.

Factor analysis (principal components with varimax rotation) was conducted to study further the item inter-relationships and to determine empirically the underlying structure. To conduct the factor analysis, given only 190 subjects, we separated the worker and environmental safety items and analyzed these separately. Furthermore, we deleted the 10 items with the lowest item-to-total correlations. Using this shorter set of 48 items, and the criterion to retain factors with eigen values greater than 1.0, six patient safety factors were identified that explained 52 percent of the variance. Keeping in mind that one of the goals at this stage was to reduce the number of items further, we systematically deleted items that loaded ambiguously (factor loadings greater than 0.45 on more than one factor). Several iterations of analyses were conducted until a stable and interpretable set of results was obtained. This final solution contained 28 items in six patient safety factors. A similar analytic approach was used on the 16 items pertaining to worker and environmental safety. Only one clear factor was identified, and it contained five items pertaining to worker safety.

The factors that emerged from this process were similar to but not identical to the original set of dimensions. The seven factors were labeled as follows:

- a. Unit manager.
- b. Socialization/training.
- c. Safety emphasis.
- d. Blame system not individual.
- e. Report and use safety data.
- f. Pharmacists.
- g. Worker safety.

Items referring to the unit manager factored separately as did the items referring to pharmacists. The majority of the items referring to physicians and hospital-level administrators were included in the safety emphasis factor. Information about the specific items within each dimension is available from the corresponding author.

The final measure contained 33 items in seven dimensions. Internal consistency reliability coefficients (Cronbach alpha) for the new dimensional structure in the pre-test data were all greater than 0.65. Table 1 contains the means and reliability coefficients for these seven dimensions. The pilot questionnaire included one measure of job satisfaction and one of quality management. To begin assessing construct validity, we hypothesized that all the safety climate subscales would be strongly related to quality management. Furthermore, we hypothesized that worker safety would be related to job satisfaction. Finally, we expected the measure to be sensitive enough to detect differences between organizations.

Table 1. Dimension means and reliability coefficients

	Number items	Means	Cronbach alpha
Unit manager	5	3.63	0.84
Socialization/ training	6	3.82	0.80
Safety emphasis	5	3.27	0.77
Blame system	5	3.59	0.78
Use safety data	4	3.34	0.74
Pharmacists	3	3.45	0.75
Worker safety	5	3.81	0.68

Means for the seven dimensions did differ across the two hospitals participating in the pilot test, although the differences were small (see Table 2). Two of the seven differences were statistically significant ($P < 0.05$), while one was marginally significant ($P = 0.061$). The two hospitals differed the most on the reporting and use of data for quality management (use safety data) and the socialization and training of staff in relation to safety (socialization/ training). Unit manager promotion of safety climate was marginally different. For these hospitals, there was no other assessment of safety climate available with which to compare our results. It is possible that there was little difference in safety climate across the two institutions.

Table 2. Means (SD) of safety climate dimensions across hospitals in pilot test

	Hospital A	Hospital B	Significance (N=190)
Unit manager	3.72 (0.64)	3.54 (0.71)	$P = 0.061$
Socialization/training	3.70 (0.56)	3.94 (0.52)	$P = 0.002$
Safety emphasis	3.29 (0.66)	3.25 (0.67)	$P = 0.656$
Blame system	3.51 (0.60)	3.67 (0.66)	$P = 0.102$
Use safety data	3.13 (0.65)	3.53 (0.69)	$P = 0.000$
Pharmacists	3.37 (0.68)	3.52 (0.76)	$P = 0.153$
Worker safety	3.77 (0.58)	3.85 (0.54)	$P = 0.355$

Correlations among the safety climate dimensions, quality management perceptions, and job satisfaction were all statistically significant (see Table 3). As predicted, the quality management scale was positively and highly correlated with all dimensions of safety climate. The safety climate dimensions most highly correlated with quality management were socialization/training ($r = 0.706$) and use safety data ($r = 0.743$). The correlations of the safety climate dimensions and Job Satisfaction were statistically significant but lower than those with quality

Table 3. Safety climate correlations with quality management and job satisfaction (N=190)

	Unit manager	Socialization/ training	Safety emphasis	Blame	Use safety data	Pharmacist	Worker safety	Quality management
Unit manager	1							
Socialization/ training	0.507	1						
Safety emphasis	0.459	0.600	1					
Blame system	0.428	0.492	0.242	1				
Use safety data	0.502	0.590	0.431	0.542	1			
Pharmacist	0.373	0.521	0.489	0.388	0.404	1		
Worker safety	0.545	0.716	0.620	0.413	0.487	0.527	1	
Quality management	0.632	0.706	0.574	0.630	0.743	0.573	0.660	1
Job satisfaction	0.292	0.430	0.358	0.253	0.320	0.298	0.420	0.482

All correlation coefficients were statistically significant at $P < 0.01$.

management. Job satisfaction was most highly correlated with the socialization/training dimension ($r = 0.430$) and the worker safety dimension ($r = 0.420$).

The results of the expert review and the pilot test provided support for the reliability (internal consistency) and validity (content, construct) of the measure. Hypotheses regarding expected differences and relationships were partially supported.

On the basis of the pilot test analyses, a seven-dimension Hospital Unit Safety Climate measure was created for use in the national study. Some of the items emerging from the factor analyses were modified to achieve clarity and to retain the balance of negatively worded items. The final version of the measure contains the seven dimensions identified through factor analysis with between three and six items each. One of the items in each patient-focused subscale is worded negatively; two worker safety items are worded negatively.

The Hospital Unit Safety Climate measure was administered a second time, 9 months later, in pilot hospital B. Hospital B had implemented new technology to improve medication administration accuracy in the interim, and we hypothesized that the safety climate scores would be higher for the second testing. Internal consistency reliability coefficients remained relatively high for the newly constituted measure (range of coefficients 0.60–0.81). The safety climate dimensions were relatively stable despite the increased emphasis on medication

accuracy over that year in hospital B (Table 4). The scores on two dimensions were marginally higher after implementing the new technology: Use safety data ($P = 0.079$) and safety emphasis ($P = 0.08$). The results of this comparison suggest that the new measure is moderately sensitive to organizational changes expected to impact safety climate. It is also possible that safety climate was not strongly impacted by implementing new technology.

Table 4. Safety climate change for hospital B units

	Time 1 N = 82	Time 2 N = 170	Significance
Unit manager	3.77 (0.63)	3.73 (0.67)	$P = 0.618$
Socialization/training	3.77 (0.52)	3.82 (0.53)	$P = 0.504$
Safety emphasis	3.31 (0.68)	3.47 (0.66)	$P = 0.080$
Blame	3.55 (0.55)	3.51 (0.58)	$P = 0.560$
Use safety data	3.16 (>0.65)	3.30 (0.60)	$P = 0.079$
Pharmacist	3.44 (0.67)	3.50 (0.70)	$P = 0.538$
Worker safety	3.82 (0.54)	3.74 (0.59)	$P = 0.307$

Discussion

The Hospital Unit Safety Climate measure is a moderate length measure to assess six dimensions of patient safety climate plus worker safety climate. Pre-testing and initial use support the reliability and validity of the measure. The sensitivity and responsiveness of the measure have tentative support, and evaluation is ongoing. From these initial analyses it appears that two of the six patient-focused dimensions may be more sensitive to differences or to change: socialization and training of staff for safety (socialization/training) and reporting and using data for improvement (use safety data). These two dimensions differed significantly across the two hospitals in the pilot test, and had the highest correlations with quality management in the pilot study. Reporting and use of data changed the most across time in hospital B (difference marginally significant).

The results of the factor analysis indicate that our initial conceptualization of professional disciplines and roles crossing dimensions did not hold for all disciplines and roles. Unit managers and pharmacists apparently have influence that is distinguishable from the dimensions of safety as we conceptualized them. Items referring to physicians or to administrators did not factor separately but were clustered with Safety Emphasis items. Our original conceptualization separated the reporting of occurrence data from the review and use of these data for quality management, but this was not supported by the data. Combining the two dimensions (reporting data and using data) into one factor makes conceptual sense and reflects empirical findings.

A number of safety climate measures are under development and are now available through electronic means, conference reports, and a few published articles. The Hospital Unit Safety Climate measure is similar to the other tools in some respects, yet differs in other respects. The Hospital Employee Survey on Patient Safety (developed by researchers at the Westat corporation) contains 64 items measuring four dimensions (hospital—14 items, hospital department—41 items, supervisor—5 items, event reporting—4 items).²⁹ More than half of the 64 items are worded negatively. The ValleyCare patient safety questionnaire is much shorter, with seven items addressing six concepts (leadership involvement, blameless culture, organizational involvement, safety concerns addressed, event reporting, areas that need improvement).³⁰ Both the American Hospital Association (AHA) and the Voluntary Hospital Association (VHA) have developed safety culture measures in conjunction with the error reporting efforts of the Institute for Safe Medication Practices (ISMP). The VHA survey (20 positively worded items) is a tool to be used by members of the safety team to assess the organization. The AHA surveys, to be completed by staff, address two areas: 18 items (15 negatively worded) address nonpunitive culture, and 13 items (5 negatively worded) address the culture of reporting.^{31, 32, 33} More information is needed about the psychometric properties of these tools and their performance in assessing safety climate.

Two groups of researchers have reported measuring safety climate in hospitals. One group used tools adapted from studies of the aviation industry.^{16, 34} Pronovost and colleagues report the results of an evaluation of the culture of safety in an academic medical center.³⁴ They used two related tools: the Safety Climate Scale, a 10-item survey of clinical staff; and the Strategies for Leadership Survey, which is used with members of the safety and management committees. The Safety Climate Scale focuses on organizational commitment to safety, knowledge of how to report adverse events, and beliefs about systems problems as a cause of error. No psychometric information is presented for the adapted version used in the study. Most of the items refer to the individual rather than the work group, and all are worded positively. Sexton and colleagues¹⁶ report on a project that compares safety attitudes between airline crews and health care staff. The survey contained 23 core items previously used with aviation crews. The items were adapted for operating room (OR) and intensive care unit physicians, nurses, and other staff. These items address perceptions of the impact of stress and fatigue, attitudes toward teamwork and hierarchy, teamwork and communication, and attitudes about errors and error reporting. The tools used in these studies fit best in the OR and intensive care units.

Another group of researchers compared health care workers in California hospitals to naval aviators, using a safety climate tool developed from five previously existing surveys (OR management attitudes, anesthesia work environment, naval command assessment, risk management questionnaire, and safety orientation in medical facilities).^{35, 36} Their tool, the Patient Safety Center of Inquiry (PSCI) culture survey, contained 30 items addressing 16 topics. The topics are as follows: reporting mistakes, rewards/punishments for reporting, feelings of blame and shame, teamwork, risk perception, process auditing,

production pressures, time and resources, mitigating decisions, organizational structure, fatigue and stress, quality of hospital operations, redundancy, rules and procedures, employee training, and culture. The focus of this tool is on attitudes and experiences indicative of the absence or antithesis of elements of safety culture. Given that, nearly half of the items are worded negatively. Referents in the items are a mix of individual and group. The factor structure that emerged from analyses may reflect the referent and the wording of the items as much as the content.

Most safety climate measures about which information was available contained dimensions referring to reporting and using event data as well as blaming the system for errors. The PSCI tool^{35,36} was the most similar to our Hospital Unit Safety Climate measure since both contain dimensions related to worker training and the use of resources to promote safety. They both also involve reporting and using event data as well as blaming the system. In the research published thus far, safety climate items are reported individually without attempting to create a summary score that would quantitatively characterize hospitals or units. The Hospital Unit Safety Climate measure is designed to create quantitative scores characterizing the strength of the units' safety climate. These scores can then be related to other indicators of patient safety.

Conclusion

There are now several safety climate scales from which to choose and more are under development. The Hospital Unit Safety Climate measure is designed to specifically address the shared workgroup safety climate in hospital inpatient units. It contains 6 patient safety dimensions and 1 worker safety dimension with a total of 33 items. All items in the measure are worded to consistently refer to the group rather than to the individual. Negatively worded items are included to reduce response set problems, and they are balanced across dimensions to avoid introducing bias (systematically skewing scores with different proportions of items worded negatively). Further work is needed to establish the sensitivity and responsiveness of this measure and to provide further reliability and validity testing.

Acknowledgments

The authors would like to acknowledge Sue Felton, Project Assistant, for her valuable support in conducting this research project.

Author affiliations

School of Nursing, University of Colorado Health Sciences Center (MAB). College of Nursing, University of Utah (GAP). Leeds School of Business, University of Colorado (JR).

Address correspondence to: Mary A. Blegen R.N., PhD., School of Nursing, University of Colorado Health Sciences Center, 4200 East Ninth Ave, Denver, CO 80262; phone: 303-315-4237; e-mail: Mary.Blegen@uchsc.edu.

References

1. Kohn LT, Corrigan JM, Donaldson MS. To err is human: building a safer health system. A report of the Committee on Quality of Health Care in America, Institute of Medicine. Washington, DC: National Academy Press; 2000.
2. Gershon R, Stone P, Bakken S, et al. Measurement of organizational culture and climate in health care. *J Nurs Adm* 2003;34(1):33–40.
3. Harrison M, Shirom A. Organizational culture. In: *Organizational diagnosis and assessment: bridging theory and practice*. California: Sage Publications; 1998. Chapter 10.
4. Sleutel, MR. Climate, culture, context, or work environment. *J Nurs Adm* 2000;30(2):53–8.
5. Scott T, Mannion R, Davies H, et al. The quantitative measurement of organizational culture in health care: a review of the available instruments. *Health Serv Res* 2004;38(3):923–45.
6. James A, Jones L. Psychological climate: dimensions and relationships of individual and aggregated work environment perceptions. *Organ Behav Hum Perform* 1979;23: 201–50.
7. Joyce W, Slocum J. Collective climate: agreement as a basis for defining aggregate climates in organizations. *Acad Manage J* 1984;27:721–42.
8. National Summit on Medical Errors and Patient Safety Research. Research agenda: medical errors and patient safety. Quality Interagency Coordination (QuIC) task force; October 2000. Available at: <http://www.quic.gov/summit/resagenda.htm>. Accessed March 6, 2003.
9. Zohar D. A group-level model of safety climate: testing the effect of group climate on micro-accidents in manufacturing jobs. *J Appl Psychol*, 2000;85 (4):587–96.
10. Varonen U, Mattila M. The safety climate and its relationship to safety practices, safety of the work environment and occupational accidents in eight wood-processing companies. *Accid Anal Prev* 2000;32:761–9.
11. Hofman DA, Morgeson FP. Safety-related behavior as a social exchange: the role of perceived organizational support and leader-member exchange. *J Appl Psychol* 1999;84(2):286–96.
12. Shannon HS, Walters V, Lewchuk W, et al. Workplace organizational correlates of lost-time accident rates in manufacturing. *Am J Ind Med* 1996;29:258–68.
13. Coyle IR, Sleeman SD, Adams N. Safety Climate. *J Safety Res* 1995;26(4):247–54.
14. Gershon RM, Karkashian, CD, Grosch JW, et al. Hospital safety climate and its relationship with safe work practices and workplace exposure incidents. *Am J Infect Control* 2000;28:211–21.
15. Helmreich RL, Foushee HC, Benson R, et al. Cockpit management attitudes: exploring the attitude-behavior linkage. *Aviat Space Environ Med* 1986;57:1198–200.
16. Sexton BJ, Thomas EJ, Helmreich RL. Error, stress, and teamwork in medicine and aviation: cross sectional surveys. *BMJ* 2000;320:745–9.
17. Spencer FC. Human error in hospitals and industrial accidents: current concepts. *J Am Coll Surg* 2000;191 (4):410–8.
18. Reason J. *Managing the risks of organizational accidents*. Hampshire England: Ashgate Publishing Limited; 1997.
19. O’Shea E. Factors contributing to medication errors: a literature review. *J Clin Nurs* 1999;8(5):496–504.
20. Blegen MA, Goode CJ, Reed L. Nurse staffing and patient outcomes. *Nurs Res* 1998;47(1):43–50.
21. Blegen, MA, Vaughn T. A multisite study of nurse staffing and patient occurrences. *Nurs Econ* 1998;16: 196–203.
22. Conklin D, MacFarland V, Kinnie-Steeves A, et al. Medication errors by nurses: contributing factors. *AARN Newsletter* 1990;46(1):17–22.
23. Roseman C, Booker JM. Workload and environmental factors in hospital medication errors. *Nurs Res* 1995;44 (4):226–9.
24. Wolf ZR, Serembus J, Smetzer J, et al. Responses and concerns of health care providers to medication errors. *Clin Nurse Spec* 2000;14(6):278–87; quiz 288–90.
25. Uribe C, Schweikhart S, Pathak D, et al. Perceived barriers to medical-error reporting: an exploratory investigation. *J Healthc Manag* 2002;47(4):263–80.

26. Wakefield DS, Wakefield BJ, Uden-Holman T, et al. Perceived barriers in reporting medication administration errors. *Best Pract Benchmarking Healthc* 1996 Jul–Aug;1(4):191–7.
27. Wakefield BJ, Wakefield DS, Uden-Holman T, et al. Nurses' perceptions of why medication administration errors occur. *Medsurg Nurs* 1998 Feb;7(1):39–44.
28. Blegen M, Vaughn T, Pepper G, et al. Patient and staff safety: voluntary reporting. *Am J Med Qual* 2004 Mar–Apr;19(2):67–74.
29. Nieva VF, Sorra JS, Mishkind M. Hospital employee survey. Unpublished survey. Rockville. MD: Westat; 2002.
30. ValleyCare Patient Safety Staff Questionnaire. Pleasanton, CA: ValleyCare Health System. www.valleycare.com. (Accessed 2002 Jul 15.) (Note: please contact author to obtain a copy of this tool.)
31. American Hospital Association Health Research & Educational Trust, Institute for Safe Medication Practices. Pathways for medication safety. HospitalConnect™, 2002. www.medpathways.info. (Accessed 2003 Jan.)
32. American Hospital Association, Voluntary Hospital Association. An organizational approach to patient safety: strategies for leadership. American Hospital Association; 2000.
33. Institute for Healthcare Improvement. Safety climate survey. <http://qualityhealthcare.org>. (Accessed 2003 Dec.)
34. Pronovost PJ, Weast B, Holzmueller CG, et al. Evaluation of the culture of safety: survey of clinicians and managers in an academic medical center. *Qual Saf Health Care* 2003;12:405–10.
35. Gaba DM, Singer SJ, Sinaiko AD, et al. Differences in safety climate between hospital personnel and naval aviators. *Hum Factors* 2003;45:173–85.
36. Singer SJ, Gaba DM, Geppert JJ, et al. The culture of safety: results of an organization-wide survey in 15 California hospitals. *Qual Saf Health Care* 2003;12: 112–8.

