Performance Improvement

Impact of the Comprehensive Unit-Based Safety Program (CUSP) on Safety Culture in a Surgical Inpatient Unit

Joanne Timmel, R.N., B.S.N.; Paula S. Kent, R.N., M.S.N., M.B.A.; Christine G. Holzmueller, B.L.A.; Lori Paine, R.N., M.S.; Richard D. Schulick, M.D.; Peter J. Pronovost, M.D., Ph.D.

Creating a safe culture is essential to improving patient safety. The Joint Commission requires hospitals to regularly measure and improve safety culture.[1] Yet *safety culture* covers a wide range of elements, from effective communication and teamwork to awareness of safety hazards and taking action to prevent them. Examples of programs that effectively improve safety culture are rare. When the chief executive officer Katsuaki Watanabe was asked about the secret to Toyota's success he noted that creating a culture of teamwork and learning from mistakes were key factors.[2] These factors are equally important in health care. More than 10 years ago, the Institute of Medicine stated that we could learn a lot from the analysis of errors.[3] Subsequent studies of adverse events found poor teamwork was a common contributing factor.[4,5] Thus, effective teamwork has surfaced as a viable method of improving the quality and safety of care provided to patients.[1,6]

An evidence base demonstrating wide variation in safety culture among units within a hospital has been building.[7–10] Because culture varies by unit, and care is organized and delivered at the unit level, it is important to intervene at this level. The Comprehensive Unit-based Safety Program (CUSP) is designed to improve the various elements that describe safety culture within a unit.[11] It can be implemented in units throughout a health system, and CUSP teams can collaborate to address hazards that span units. This program provides a knowledge base about the science of safety so that frontline staff can recognize safety hazards in their workplaces and safely design interventions to mitigate or eliminate these hazards. Moreover, it emphasizes the importance of effective teams, prompts units to partner with a senior hospital executive to help in their safety efforts, trains staff to use a practical tool to investigate and learn from defects, and offers tools to improve teamwork and communication. CUSP provides enough structure so that hospital leaders can use it as a strategy to improve safety, yet it is flexible to a local unit's context and specific concerns.

Article-at-a-Glance

Background: A culture of teamwork and learning from mistakes are universally acknowledged as essential factors to improve patient safety. Both are part of the Comprehensive Unit-based Safety Program (CUSP), which improved safety in intensive care units but had not been evaluated in other inpatient settings.

Methods: CUSP was implemented beginning in February 2008 on an 18-bed surgical floor at an academic medical center to improve patient safety, nurse/physician collaboration, and safety on the unit. This unit admits three to six patients per day from up to eight clinical services.

Results: Staff implemented several interventions to reduce safety hazards and improve culture. Surgical patients admitted to one clinical service were cohorted on this unit to increase physician presence. A team-based goals sheet was implemented to improve communication and coordination of daily goals of care. Nurses were included on rounds to form an interdisciplinary team. Five of six culture domain scores demonstrated significant improvements from 2006 and 2007 to 2008. There was a 27% nurse turnover rate in 2006 and a 0% turnover rate in 2007 and 2008.

Conclusions: Improvements were observed in safety climate, teamwork climate, and nurse turnover rates on a surgical inpatient unit after implementing a safety program. As part of the CUSP process, staff described safety hazards and then as a team designed and implemented several interventions. CUSP is sufficiently structured to provide a strategy for health care organizations to improve culture and learn from mistakes, yet is flexible enough for units to focus on risks that they perceive as most important, given their context. Broad use of this program throughout health systems could arguably produce substantial improvements in patient safety.

Copyright 2010 Joint Commission on Accreditation of Healthcare Organizations

Although CUSP has been used to improve safety in intensive care units (ICUs),[11,12] its impact has not been formally evaluated outside the ICU. This article reports an evaluation of the impact of CUSP (1) on safety climate, which describes staff perceptions of the safety norms and behaviors in the workplace, and (2) on teamwork climate in an adult surgical oncology unit, as well as on staff's ability to learn from medical errors.

Methods

Study Setting

The CUSP intervention was included in a hospitalwide initiative to systematically assess and improve safety culture at the Johns Hopkins Hospital. This initiative began in 2005 and included, among other efforts, annual assessments of culture using the Safety Attitudes Questionnaire (SAQ).[13] More than 170 clinical areas or units are involved in the hospital initiative; all use the hospital's error-reporting system, and many are creating some level of CUSP. The CUSP intervention was implemented on an 18-bed surgical unit (Weinberg 4C) in February 2008. Weinberg 4C (W4C) provides care to patients admitted to eight clinical services: plastic surgery; gastrointestinal surgery; endocrine surgery; orthopedics; surgical oncology; ear, nose, and throat surgery; breast oncology; and trauma. The average census is 17–18 patients, and on average the unit admits 3 to 6 patients per day.

The nurse manager [J.T.] decided to create a CUSP team on the basis of a commitment to improve safety and a desire to improve teamwork and communication. Because of their interest in improving the quality of care, patient flow, and nurse/physician collaboration, physicians for the CUSP team were recruited from the surgical oncology service.

Intervention

Evolution of CUSP. The CUSP was pilot-tested as an eight-step program in two ICUs at Johns Hopkins starting in 2001.[11] It evolved to a six-step program as the investigator [P.J.P.] worked with frontline staff to fit CUSP into daily work processes. He found that the steps to implement interventions, document, and share the results intuitively folded into the step in which staff identify safety concerns, and that only one step was needed to describe the culture assessment process. Moreover, the investigator found that health care providers or hospitals recovered but infrequently learned from defects, and he also knew of the shortcomings in teamwork and communication. Thus, he developed practical yet scientifically sound tools to learn from defects[14] and to improve teamwork and communication[15–17] and included them as steps in CUSP.

The CUSP process was revisited in Fall 2008, when it was packaged with a bloodstream infection intervention and launched as a national program.[18] When CUSP was piloted, culture was not being measured at Johns Hopkins, and pre-post steps were needed to assess the impact of this program. Culture assessment is now routinely done by the hospital and no longer necessary as a CUSP step. Table 1 (page 254) describes the current six-step version of CUSP.

CUSP implementation on W4C. Before implementing CUSP, W4C assembled a multidisciplinary team to initiate CUSP activities, providing a more diverse and comprehensive view of unit work systems, roles and responsibilities of different disciplines, and perceptions of safety and teamwork. Moreover, it provided a model of collaboration and teamwork among nurses, surgeons, residents, and other disciplines. The team was led by the nurse manager and a senior surgeon [R.D.S.], who acted as the CUSP champions, and included a CUSP coach [P.S.K.] from the patient safety department at Johns Hopkins[19] and a senior hospital executive [P.J.P.]. The hospital safety department selected the executive and discussed its choice with the nurse manager, who accepted its recommendation.

The CUSP team met monthly with unit staff, which typically included direct care nurses, surgeons, residents, nurse practitioners, unit clerks, and nursing assistants, with invitations sent to social workers, unit-based pharmacists, and the unit chaplain. The meetings were facilitated by the coach, unit champions, and the senior executive and lasted one hour.

The science of safety training (Step 1) was used to kick off the CUSP initiative and was held off site at an all-staff team meeting in November 2007.[20] At the end of the training program, frontline staff were given a two-question safety assessment survey (Step 2) that asked how the next patient would be harmed and how this could be prevented.

The coach worked with the nurse champion to assemble and categorize the staff's responses to the two-question survey and to gather other data to help identify safety hazards on W4C. These data included unit scores from the hospital's annual culture assessment, sentinel events, and reports submitted to the hospital's Web-based error-reporting system by W4C staff. They presented these data to the entire team to gain group consensus about the hazards that presented the greatest risk to patients on this unit. As a group, the team members prioritized and chose safety issues, developed action plans, and implemented interventions (Step 3). They used informal methods (group consensus) to prioritize safety issues.

Finally, the CUSP team was asked to learn from one defect per month (Step 4).[14] Learning was defined as being able to

Copyright 2010 Joint Commission on Accreditation of Healthcare Organizations

Table 1. Comprehensive Unit-Based Safety Program (CUSP) Process*

Step	Title	Description
1	Science of safety training	The objectives of this educational curriculum: ■ Understand safety is a property of a system. ■ Understand the principles of safe design (standardize work, create independent checks with checklists, learn when things go wrong). ■ Recognize the principles of safe design apply to technical work and teamwork. ■ Understand teams make wise decisions when there is diverse and independent input.
2	Identify safety hazards	Ask all frontline staff: ■ How will the next patient be harmed in your unit? ■ How could this harm be prevented?
3	Senior executive partnership	Senior hospital executive helps the CUSP team members prioritize their safety hazards, holds them accountable for learning from defects, and ensures they have resources and political support to implement interventions.
4	Learn from defects	CUSP team is trained to use a structured tool to learn from one defect per month; answer 4 questions†: ■ What happened? ■ Why did it happen? ■ What did you do to reduce the risk of a recurring event? ■ How do you know that you actually reduced this risk?
5	Implement improvement tools	CUSP teams are given a menu of teamwork and communication tools and asked to use tools that best address their needs.

* The CUSP process is iterative in that staff continuously identify and mitigate hazards and improve teamwork, and new staff are provided the science of safety training.

† Pronovost P.J., et al.: A practical tool to learn from defects in patient care. *Jt Comm J Qual Patient Saf* 32:102–108, Feb. 2006.

answer these questions: What happened? Why did it happen? What can be done to prevent this event in the future? How will you know it worked? The team reviewed its findings from the defect investigation at each monthly CUSP meeting and was also encouraged to implement a variety of tools, such as the daily goals form, to improve teamwork and communication.[14]

During monthly meetings, all participants discussed the barriers to providing safe patient care, what tools would be most helpful, and how best to implement them. The opinions of the nurse champion and frontline staff held the highest value when making decisions.

A time line of CUSP–related activities is outlined in Table 2 (page 255).

Dependent Variables

The primary dependent variables were teamwork climate and safety climate scale scores from the SAQ.[13] We chose these as our primary dependent variables because they are important in preventing patient harm, CUSP is designed to improve them, and specific interventions were implemented on W4C to target their improvement. Secondary dependent variables were morale, stress recognition, working conditions, perceptions of management, perceptions of unit management scale scores from the SAQ, and nurse turnover. Safety culture is assessed annually throughout the Johns Hopkins Hospital using the SAQ, a validated and psychometrically sound instrument. A 36-item survey, it assesses staff perceptions of seven domains of safety culture: safety climate, teamwork climate, job satisfaction, perceptions of management, perceptions of unit management, stress recognition, and working conditions. Participants responded using a 5-point Likert scale (agree strongly, agree slightly, neutral, disagree slightly, disagree strongly) and "not applicable."

A 60% response rate on a unit was required for a representative sample of frontline staff on the unit. A 60% response rate is generally accepted as a minimum threshold in survey research to reduce the risk for response bias.[21]

All staff members with a 50% employment commitment to W4C for at least the four consecutive weeks before survey administration were given a survey; participation was voluntary. Nurse turnover data, routinely collected by central nursing administration, were defined as the percent of nurse full-time equivalents (FTEs) who left the institution during the year; data for 2007 and 2008 are reported. Turnover data are sum-

Copyright 2010 Joint Commission on Accreditation of Healthcare Organizations

Table 2. Comprehensive Unit-Based Safety Program (CUSP) Time Line of Activities*

Activities	Nov. 2007	Feb. 2008	Mar.–May 2008	May 12–18, 2008	May 19, 2008	Jun. 2008	Jul.–Nov. 2008	Nov. 10, 2008	Dec. 2008–present
Science of safety education (CUSP Step 1)	■								
CUSP implemented (Step 2, discussion of Steps 3–5)		■							
Monthly Meetings		■	■	■	■	■	■	■	■
Preparation for Phase I pilot				■					
Pilot testing Phase I implemented					■	■			
SAQ administered						■			
Pilot testing Phase II implemented								■	■

* SAQ, Safety Attitudes Questionnaire.

marized and reported annually rather than more frequently because of the small number of employees on W4C.

Statistical Analysis

Responses from the staff safety assessment survey were categorized by type of safety issue (communication, medication error, equipment and supplies, procedures, and falls). The proportion of responses describing each category were calculated by tabulating the number of responses in each category and dividing by the total number of responses received. We report the individual item scores for safety climate and teamwork climate. The primary dependent variables were the percent of staff on W4C who reported a positive safety climate score and a positive teamwork climate score. To estimate this, we converted the 5-point Likert scale into a dichotomous response (1 to 2 = negative score, 3 = neutral, and 4 and 5 = positive score). Safety climate and teamwork climate scale scores were calculated for individual respondents by taking the average of the items in each domain (one item was reverse scored in each domain due to negative wording). Unit-level results were calculated as the percent of respondents who reported a positive score. Culture scores are reported for 2006, 2007, and 2008, and both overall scale scores and scores for each item in the scale are described. We reported two years of pre–CUSP culture scores to establish a trend in W4C culture. The SAQ was administered in June 2008, seven months after CUSP was launched with the science of safety training retreat. For descriptive comparison, we also reported overall hospital (144 clinical areas) scores for each domain for the same time periods. A *t*-test was used to present changes over time.

Results

Table 3 (page256) summarizes the staff assessment survey results, as well as action plans discussed and goals set by the CUSP team. Issues categorized as communication accounted for the majority of responses (39%). Staff stated their major concern was the large number of services admitting to W4C, which caused multiple communication problems and confusion regarding the plan of care, inadequate discharge planning, and difficulty getting physician intervention when a patient's condition deteriorated. The CUSP team's recommended goals were to improve communication among staff members and with patients and to improve continuity of care.

Subsequent Interventions

Table 4 (page 257) outlines the interventions undertaken by W4C staff to improve communication and coordination and continuity of care. The interventions resulted from hazards identified during staff assessments or in the process of learning from mistakes.

Pilot Phase I. The following three interventions, as listed in Table 4, were developed and implemented in May 2008 (Phase I pilot):

- A newly designed team-based daily goals sheet was used during patient rounds.
- Surgical patients admitted to the Cameron Blue service were preferentially cohorted on W4C.
- The night-shift charge nurse started attending morning rounds with the Cameron Blue service.

The rounding nurse brought the daily goals sheet, which listed the Cameron Blue patients and any concerns that the nurses identified. During rounds, the nurse filled in the plans for the day and goals before discharge. The night-shift nurse reviewed the goals with the day-shift nurses, who, in turn, included this information in the written and verbal shift report.

To help implement the cohorting of Cameron Blue patients, the nurse champion and a staff nurse met with Cameron Blue housestaff and attending physicians to discuss the cohorting of their patients on W4C. Nursing leadership from the Department of Surgery attended a CUSP team meeting and

Copyright 2010 Joint Commission on Accreditation of Healthcare Organizations

Table 3. Top Safety Issues Identified and Action Plan*

Safety Issue Category (% responses)	Action Plan	Goal
Communication (39%)	1. Discussed implementing a Plan of Care column on the Nursing Report Sheet 2. Discussed idea of having charge nurse present to "run the list" with at least one team 3. Discussed development of a Daily Goals Sheet 4. Suggest implementation of a pilot program having a unit-based hospitalist or nurse practitioner to support care. 5. Invite Residents to attend CUSP meetings. 6. MD/RN shadowing experiences discussed 7. Discussed monthly RN/MD luncheon 8. Have RN round with at least 1 team to improve communication of plan of care.	Improve staff communication across multiple disciplines and improve continuity of care.
Medication Error (33%)	1. Need to address PCA orders vs. IV push	Reduce the number of reportable medication errors on Weinberg 4C.
Equipment and Supplies (11%)	1. Lack of isolation carts. Should address the new isolation procedures, which require each staff entering room to fully gown and take precautions.	Maintain adequate equipment and supplies for the care of patients.
Procedures (11%)	Not developed	n/a
Falls (6%)	Not developed	n/a

* CUSP, Comprehensive Unit-based Safety Program; PCA, patient-controlled analgesia; IV, intravenous.

agreed to support a pilot to cohort Cameron Blue patients. Finally, the nurse champion met with the night-shift nursing staff to secure their buy-in to attend morning rounds.

Pilot Phase II. Phase II of the pilot (November 2008) involved several revisions to Phase I activities and some new activities, as follows:

- The team-based daily goals sheet was revised to a more structured checklist format.
- All night-shift nurses were included in morning rounds, if possible.
- Rounding occurred at the bedside to include the patient in discussions about their care.
- Final goals and an anticipated discharge date were written on the white board in the patient's room (Table 4).
- The Cameron Blue team began to notify staff when morning and afternoon rounds were starting.

December 2008–Present. W4C has remained active in using CUSP to improve communication, teamwork, and coordination and management of patients. For example, the CUSP team established ongoing meetings with the hospital's pain management team to address their patients' pain issues (Table 4).

Culture Improvements and Nurse Turnover

SAQ Domain Scores. Figure 1 (right) shows the W4C domain scores from the SAQ; all domains in 2008, with the

Percentage of Weinberg 4C Staff Reporting a Positive Score for the Seven Safety Attitudes Questionnaire (SAQ) Domains

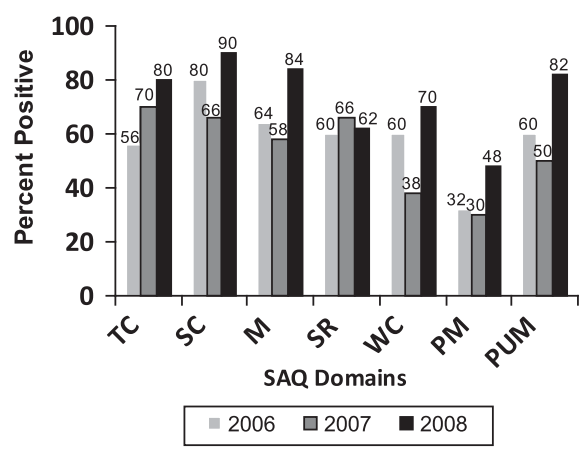

Figure 1. *All domains in 2008, with the exception of stress recognition (SR), saw statistically significant improvements (p < .001). A score of < 60% indicates a domain of culture that is in the danger zone and needs to improve. A score of > 80% indicates a domain of culture that is good. A positive score is a response of 4 or 5 on the 5-point Likert response scale. Scale scores for the domains for individual respondents were calculated by taking the average of the items in each domain. Unit-level results were calculated as the percentage of respondents who reported a positive score. TC, teamwork climate; SC, safety climate; M, morale; SR, stress recognition; WC, working conditions; PM, perceptions of management; PUM, perceptions of unit management.*

Copyright 2010 Joint Commission on Accreditation of Healthcare Organizations

Table 4. Interventions Implemented to Mitigate Risks (Learn from Mistakes)

Date Implemented	Intervention	Safety Issue
May 19, 2008 (Pilot Phase I)	■ Team-based daily goals sheet	■ Poor communication ■ Ambiguity of care
	■ Cohorting Cameron Blue patients on Weinberg 4C	■ Inefficient coordination of care and management ■ Absence of Cameron Blue physicians ■ Delays in care
	■ Night-shift charge nurse attends morning rounds	■ Poor communication
November 10, 2008 (Pilot Phase II)	■ Bedside day-shift nurses attend afternoon rounds ■ Added white boards to patient rooms	■ Poor nurse autonomy ■ Poor communication between physician and nursing staff ■ Absence of physicians from unit ■ Unclear patient care goals
	■ Discharge instructions written in advance	■ Delays in care
December 2008 to present	■ Johns Hopkins Hospital erected new antennae for pager system ■ White board put on unit to record nurses' nonurgent questions for residents ■ Monthly breakfast on first day of new resident team	■ Poor communication ■ Delays in care ■ Poor teamwork
	■ Meeting with hospital pain management team ■ Meeting with interventional radiology about care during procedures ■ Upgraded to wireless computers to prevent disconnection	■ Poor coordination of care and management ■ Delays in care

exception of stress recognition, saw statistically significant improvements. Overall hospital domain scores for 2006 compared with 2008 were 65% versus 71% for teamwork climate, 61% versus 69% for safety climate, 61% versus 66% for job satisfaction, 39% versus 47% for perceptions of hospital management, 62% versus 68% for perceptions of unit management, 48% versus 55% for working conditions, and 45% versus 46% for stress recognition; all were statistically significant ($p \leq .001$) except stress recognition. Overall response rates for the SAQ were 89% (25 of 28) in 2006 and 100% ($n = 27$) in 2007 and 2008 ($n = 28$). Respondents included nurses and support staff. Physicians were surveyed as part of the department of surgery, and we could not separate these respondents (surveys anonymous) to link them to the Cameron Blue Service.

Item Scores for the Safety and Teamwork Climate Domains. Table 5 (page 258) provides item scores for the safety climate and teamwork climate domains for the three-year period studied. Five of the six teamwork climate items, and six of the seven safety climate items, improved from 2006 and 2007 to 2008.

Nursing Turnover. In 2007, 3 of 12 FTEs left the hospital (27% turnover rate), and the turnover rate was 0% for the 16 FTEs in 2008 and 2009.

Discussion

In this study, implementing CUSP on a surgical inpatient unit was followed by improvement in the climate of safety and teamwork. Frontline staff members' positive perceptions of teamwork improved by 10 percentage points, and perceptions of safety improved by 23 percentage points, from 2007 to 2008. Although improving climate and learning from mistakes are essential to improve patient safety,[3] few strategies have demonstrated an ability to accomplish these goals. The CUSP initiative has improved safety culture and the ability to learn from mistakes in ICUs,[11,12] but it had not been robustly evaluated outside the ICU.

As described, in Step 2 of the CUSP process, staff independently described critical safety hazards and then came together and worked as a team to design and implement several interventions to reduce these risks. Although nurses in particular can easily spot an unsafe situation, CUSP provided the platform to bring these experiences to everyone on the unit and to empower the group to solve these problems. On surgical inpatient units, the physician team is usually in the operating room for most of the day shift and often inaccessible to the nursing staff. The W4C CUSP team adapted the ICU version of the daily goals sheet[15] to a team-based inpatient tool[22] to help rectify the absence of a unit-based physician team. This structured tool

Copyright 2010 Joint Commission on Accreditation of Healthcare Organizations

Table 5. Pre-Post Teamwork and Safety Climate Scale and Item Scores

Domain Item	2006 %	2007 %	2008 %
Teamwork Climate Scale			
Domain Items			
Nurse input is well received in this clinical area.	68	84	86
In this clinical area, it is difficult to speak up if I perceive a problem with patient care.	12	20	12
Disagreements in this clinical area are resolved appropriately (i.e., not who is right, but what is best for the patient).	76	88	90
I have the support I need from other personnel to care for patients.	52	76	90
It is easy for personnel here to ask questions when there is something that they do not understand.	92	92	96
The physicians and nurses here work together as a well-coordinated team.	40	54	66
Safety Climate Scale			
Domain Items			
I would feel safe being treated here as a patient.	58	66	90
Medical errors are handled appropriately in this clinical area.	64	58	80
I know the proper channels to direct questions regarding patient safety in this clinical area.	96	96	94
I receive appropriate feedback about my performance.	80	80	94
In this clinical area, it is difficult to discuss errors.	16	26	6
I am encouraged by my colleagues to report any patient safety concerns I may have.	92	92	96
The culture in this clinical area makes it easy to learn from the errors of others.	70	70	76

improved communication and collaboration among the nurses and physicians and led to more effective coordination of daily care plans and efficient movement of patients to discharge. Staff safety assessments also described the random assignment of Cameron Blue service patients to any of five different units as an inefficient use of time and unsafe for patients. Thus, cohorting Cameron Blue patients on one unit increased the efficiency and timeliness of rounds and nurse access to the physician. In addition, creating interdisciplinary rounds established a platform in which nurses could voice concerns, seek clarification about a patient's management, and gain autonomy as the bedside caregiver. All these interventions lessen the hierarchy that causes ineffective collaboration and coordination among clinical disciplines.[23,24]

We also observed a decrease in nurse turnover rates from 2007 to 2008 that coincided with the implementation of CUSP in 2008. In a literature review, MacDavitt and colleagues found that perceived staffing levels, collaboration, and communication influenced nurse turnover, and perceived support from the supervisor influenced job satisfaction.[25] The improvements that we observed in teamwork climate, working conditions, perceptions of unit management, and morale corroborate MacDavitt's findings. Although we cannot make causal inferences, our findings are encouraging, and when coupled with the impact of CUSP in the ICU,[11] provide evidence for the effect of CUSP on W4C's safety and teamwork climate and nurse turnover.

The CUSP intervention includes an executive partnership that likely affected culture improvement. There is a growing body of literature relative to the positive impact of executive walkrounds on culture.[26–28] Evidence suggests that more frequent executive visits are associated with improved culture. Indeed, there appears to be a dose-dependent improvement relative to the number of executive visits.[26] In CUSP, the hospital senior executive met monthly with W4C staff and became a part of the improvement team. He listened to staff concerns, helped them learn from mistakes and establish priorities for safety hazards, empowered them to seek change, and provided resources as needed for improvement work. For example, the executive talked independently with hospital leaders to obtain support for cohorting patients and helped garner resources, such as in the replacement of dead batteries in many of the portable computers. Moreover, a system was developed to check and replace computer batteries on a timely basis. Thus, CUSP represents a more structured and proactive approach to executive walkrounds. The combination of a senior leader who actively supported the team's efforts, a process to follow up on safety issues, and the development of a trusting relationship between the executive and the unit staff likely made this program successful. Executives typically spend 9 to 12 months with a unit before rotating to another unit, and departmental leaders move in to fill the executive role.

CUSP is sufficiently structured to provide a strategy for health care organizations to improve culture and learn from mistakes, yet is flexible enough for units to focus on risks that they perceive as most important, given their context.

Copyright 2010 Joint Commission on Accreditation of Healthcare Organizations

Organizations can select units that either have low climate scores or are perceived as high risk and can implement CUSP teams in these units. Rather than just recovering from risks (for example, tracking down and retrieving the missing supply), CUSP trains staff to learn from mistakes (for example, reduce the risk that the supply will be missing from the unit inventory the next time it is needed to treat a patient).

This study has some limitations. First, we did not measure clinical outcomes. Our primary dependent variables were teamwork climate and safety climate. Yet, culture has been extensively validated and correlates with clinical outcomes.[11,12] Second, we presented data from one only unit. Nevertheless, we have used CUSP throughout the Johns Hopkins Hospital and have seen improvements in culture. Third, our study design does not allow us to make causal inferences regarding the use of CUSP and improved safety culture. Although a randomized design may have allowed us to make a causal inference, such a design was not ethical or practical. Moreover, CUSP is being used across the hospital, and it would be difficult to find a unit that has not been exposed at some level to this intervention. Fourth, we did not formally evaluate the extent to which these interventions reduced the risks that future patients will be harmed. Most of these events cannot be measured as rates, and we lack a scientifically sound yet feasible approach to measure the extent to which risks were reduced. Fifth, the senior hospital executive leads safety and quality improvement initiatives at the Johns Hopkins Hospital, and his credibility may have contributed to the results achieved in W4C, making them less generalizable to other units. Sixth, we do not know the relative importance of each step of CUSP. Nevertheless, CUSP is informed by robust theory and designed as a program to infuse a better sense of safety, hazards, and methods to redesign systems into daily practice. Seventh, we cannot evaluate the independent impact of CUSP versus other safety efforts on which the hospital embarked. Nevertheless, CUSP was the only hospitalwide program specifically implemented on W4C during this study. Eighth, our measures of learning from mistakes are immature. Further research is needed to develop effective and efficient methods to evaluate the extent to which patient risks have been reduced and to determine the optimal level (for example, unit, department, hospital, system) to implement risk-reduction efforts.

Summary

The use of CUSP was associated with improvements in all domains of culture except stress recognition. There was also a concurrent decrease in nurse turnover on the surgical unit. Moreover, unit staff identified safety hazards and implemented interventions to reduce these risks and to design safer systems of care. Broad use of this program throughout health systems could arguably produce substantial improvements in patient safety. Further research is needed to evaluate the associations between improvements in safety culture and clinical and economic outcomes. J

Joanne Timmel, R.N., B.S.N., is Nurse Manager, The Johns Hopkins Hospital, Baltimore, and **Paula S. Kent, R.N., M.S.N., M.B.A.,** is Patient Safety Coordinator. **Christine G. Holzmueller, B.L.A.,** is Medical Writer and Editor, Department of Anesthesiology and Critical Care Medicine, Quality and Safety Research Group, The Johns Hopkins University, Baltimore. **Lori Paine, R.N., M.S.,** Director, Patient Safety, The Johns Hopkins Hospital. **Richard D. Schulick, M.D.,** is Associate Professor, Department of Surgery, Surgical Oncology, The Johns Hopkins University. **Peter J. Pronovost, M.D., Ph.D.,** is Professor, Department of Anesthesiology and Critical Care Medicine, Quality and Safety Research Group, and Departments of Surgery and Health Policy and Management, The Johns Hopkins University, and a member of *The Joint Commission Journal on Quality and Patient Safety*'s Editorial Advisory Board. Please address requests for reprints to Peter Pronovost, ppronovo@jhmi.edu.

References

1. The Joint Commission: *Behaviors That Undermine a Culture of Safety. Applicable Joint Commission Standards: Standard LD.03.01.01.* http://www.jointcommission.org/NewsRoom/PressKits/Behaviors+that+Undermine+a+Culture+of+Safety/app_stds.htm (last accessed Apr. 19, 2010).
2. Stewart T.A., Raman A.P.: An Interview with Katsuaki Watanabe: Lessons from Toyota's long drive. *Harv Bus Rev* 85:74–83, Jul.–Aug. 2007. http://hbr.org/2007/07/lessons-from-toyotas-long-drive/ar/1 (last accessed Apr. 19, 2010).
3. Institute of Medicine: *To Err Is Human: Building a Safer Health System.* Washington, DC: National Academy Press, 1999.
4. Woodward H.I., et al.: What have we learned about interventions to reduce medical errors? *Annu Rev Public Health* 31:479–497, Apr. 21, 2010. Epub. Jan. 4, 2010.
5. Manser T.: Teamwork and patient safety in dynamic domains of healthcare: A review of the literature. *Acta Anaesthesiol Scand* 53:143–151, Feb. 2009.
6. Institute of Medicine: *Crossing the Quality Chasm: A New Health System for the 21st Century.* Washington, DC: National Academy Press, 2001.
7. Singer S.J., et al.: Patient safety climate in 92 US hospitals: Differences by work area and discipline. *Med Care* 47:23–31, Jan. 2009.
8. Huang D.T., et al.: Perceptions of safety culture vary across the intensive care units of a single institution. *Crit Care Med* 35:165–176, Jan. 2007.
9. Rose J.S., et al.: A leadership framework for culture change in health care. *Jt Comm J Qual Patient Saf* 32:433–442, Aug. 2006.
10. Sexton J.B., et al.: *Safety Attitudes Questionnaire* (unpublished results from survey assessments). Baltimore, Dec. 2010.
11. Pronovost P., et al.: Implementing and validating a comprehensive unit-based safety program. *J Patient Saf* 1:33–40, Mar. 2005.
12. Pronovost P.J., et al.: Improving patient safety in intensive care units in Michigan. *J Crit Care* 23:207–221, Jun. 2008.

Copyright 2010 Joint Commission on Accreditation of Healthcare Organizations

13. Sexton J.B., et al.: The Safety Attitudes Questionnaire: Psychometric properties, benchmarking data, and emerging research. *BMC Health Serv Res* 6(44):Apr. 3, 2006.
14. Pronovost P.J., et al.: A practical tool to learn from defects in patient care. *Jt Comm J Qual Patient Saf* 32:102–108, Feb. 2006.
15. Pronovost P., et al.: Improving communication in the ICU using daily goals. *J Crit Care* 18:71–75, Jun. 2003.
16. Thompson D.A., et al.: A morning briefing: Setting the stage for a clinically and operationally good day. *Jt Comm J Qual Saf* 31:476–479, Aug. 2005.
17. Thompson D.A., et al.: View the world through a different lens: Shadowing another provider. *Jt Comm J Qual Patient Saf* 34:614–618, Oct. 2008.
18. Herzer K., et al.: Washington, DC: A success story in American health care: Eliminating infections and saving lives in Michigan. U.S. Department of Health and Human Services, Dec. 1, 2009. http://www.healthreform.gov/reports/success/michigan.html (last accessed Apr. 19, 2010).
19. Pronovost P.J., et al.: Paying the piper: Investing in infrastructure for patient safety. *Jt Comm J Qual Patient Saf* 34:342–348, Jun. 2008.
20. Pronovost P.J.: The science of improving patient safety (PowerPoint presentation). Sep. 6, 2009. http://www.safercare.net/OTCSBSI/Staff_Training/Entries/2009/9/6_1._The_Science_of_Improving_Patient_Safety.html (last accessed Apr. 19, 2010).
21. Pronovost P., et al.: Assessing safety culture: Guidelines and recommendations. *Qual Saf Health Care* 14:231–233, Aug. 2005.
22. Holzmueller C.G., et al.: Implementing a team-based daily goals sheet in a non-ICU setting. *Jt Comm J Qual Patient Saf* 35:384–388, 341, Jul. 2009.
23. Thomas E.J., et al.: Working together in the neonatal intensive care unit: Provider perspectives. *J Perinatol* 24:552–559, Sep. 2004.
24. Stewart J., et al.: Clinical nurses' understanding of autonomy: Accomplishing patient goals through interdependent practice. *J Nurs Adm* 34:443–450, Oct. 2004.
25. MacDavitt K., et al.: Organizational climate and health care outcomes. *Jt Comm J Qual Patient Saf* 33(11 suppl.):45–56, Nov. 2007.
26. Frankel A., et al.: Revealing and resolving patient safety defects: The impact of leadership WalkRounds on frontline caregivers assessments of patient safety. *Health Serv Res* 43:2050–2066, Dec. 2008. Epub Jul. 29, 2008.
27. Thomas E.J., et al.: The effect of executive walk rounds on nurse safety climate attitudes: A randomized trial of clinical units [ISRCTN85147255] [corrected]. *BMC Health Serv Res* 5:28, Apr. 11, 2005.
28. Frankel A., et al.: Patient Safety Leadership WalkRounds at Partners Healthcare: Learning from implementation. *Jt Comm J Qual Patient Saf* 31:423–437, Aug. 2005.

Copyright 2010 Joint Commission on Accreditation of Healthcare Organizations