Using the AHRQ Hospital Survey on Patient Safety Culture as an Intervention Tool for Regional Clinical Improvement Collaboratives

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Abstract

Objective: From 2005 to 2007, the Agency for Healthcare Research and Quality (AHRQ) *Hospital Survey on Patient Safety Culture* was used as an assessment and intervention tool for hospitals participating in regional improvement collaboratives led by the Delmarva Foundation and Maryland Patient Safety Center. The collaboratives focused on specific hospital microsystems [emergency departments (EDs), intensive care units (ICUs), and operating rooms [ORs)] and measurable clinical outcomes. **Methods**: The survey was administered to staff during the collaborative's pre-intervention period and end point. Teams implemented clinical interventions and selected culture goals. Collaborative support was provided through workshops, site visits, conference calls, and a virtual workspace. **Results**: 38 percent of ED teams, 57 percent of ICU teams, and 92 percent of OR teams improved in the *Overall Perception of Safety*. Teams improved in several culture dimensions, including *Teamwork Within Units* and *Communication Openness*. **Conclusion:** Improvements were most robust within each microsystem and less apparent between microsystems.

Introduction

Culture change and a positive safety culture are increasingly being identified as essential components of successful and sustainable transformative change. The Institute of Medicine (IOM) has identified safety as a property of a health care system rather than of an individual, noting that moving from a culture of blame to one of learning and improving is one of the major challenges in creating a safer health care system.[1]

There are many definitions for safety culture, ranging from culture as an organizational attribute to a general descriptor of an organization.[2] Mearns and Flin have observed that safety culture is a "complex and enduring trait reflecting fundamental values, norms, assumptions, and expectations." [3] The Advisory Committee on the Safety of Nuclear Installations defines the culture of safety as the "product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to, and proficiency of, an organization's health and safety," [4] a definition that has also been identified as relevant to health care organizations.[5, 6]

A number of frameworks or models for culture change have been developed and applied to health care. In "Human Error: Models and Management,"[7] James Reason describes the attributes

of high-reliability organizations and the application of these attributes to the health care setting. He discusses the debate between a person and system approach, noting that high-reliability organizations display approaches that focus on the system and system improvements are dynamic in response to an event, and see those events as opportunities for system improvement.

Another widely applied model is the "Just Culture" model by David Marx,[8, 9] which balances individual responsibility with system values, addressing the need to find equilibrium between blame-free versus overly punitive approaches. As another example, the "Capability Maturity" model describes five steps or stages to sustainable high performance.[10] These five steps have been adapted to the health care environment and suggest a developmental approach to culture change that builds a strong foundation for improvement.

Culture assessment was the foundation for three regional clinical improvement collaboratives hosted by the Delmarva Foundation from 2005 to 2007. These unit-based programs coupled safety culture approaches with clinically relevant topics and provided training on quality improvement techniques and culture measurement. By partnering culture change with clinically relevant interventions and implementing those changes at the unit level, we expected to create a workplace where employees would be engaged in identifying, measuring, and redesigning processes of care, with the goal of providing every patient with the best possible care. This approach has also been used in other regional and national collaborative improvement programs.

It was our hypothesis that a focus on safety culture as well as on clinical interventions would lead hospitals to implement improvements that change fundamental norms in the targeted microsystem. Efforts to address and improve the culture of patient safety required an instrument for assessing and measuring the patient safety culture. To this end, we employed the *Hospital Survey on Patient Safety Culture*, developed by the Agency for Healthcare Research and Quality (AHRQ),[11] as a tool for hospitals to assess their patient safety culture, track changes in patient safety over time, and to evaluate the impact of patient safety interventions.

Since its release in November 2004, the *Hospital Survey on Patient Safety Culture* has been used by more than 400 hospitals across the country. The survey, which measures hospital staff opinions about patient safety issues, medical errors, and event reporting, includes 42 items that measure 12 dimensions of patient safety culture:

1. Communication openness.
2. Feedback and communication about error.
3. Frequency of events reported.
4. Handoffs and transitions.
5. Management support for patient safety.
6. Nonpunitive response to error.
7. Organizational learning/continuous improvement.
8. Overall perceptions of patient safety.
9. Staffing.
10. Supervisor/manager expectations and actions promoting safety.
11. Teamwork across units.
12. Teamwork within units.

Incorporating the *Hospital Survey on Patient Safety Culture* into the collaborative model provided the hospitals with a measure of their safety culture and a benchmark for comparison, all at no cost to the hospital. This manuscript describes how the *Hospital Survey on Patient Safety Culture* was applied as an intervention and assessment tool in regional collaboratives that focused on clinical improvements in high-risk emergency department (ED), intensive care unit (ICU), and operating room (OR) settings. Trends in improvement measured by these tools are also described.

Project Descriptions

Delmarva Foundation is a nonprofit organization that offers regional clinical improvement programming to hospitals in the Mid-Atlantic region. The programs catalyze improved patient safety by focusing on enhancing improvement and teaming skills within clinical microsystems while at the same time, building durable networks of cooperation and innovation between health care facilities. Using an approach inspired by the Institute for Healthcare Improvement (IHI) Breakthrough Series Collaborative model, Delmarva Foundation worked with hospitals from Maryland, the District of Columbia, and Northern Virginia to implement evidence-based strategies to improve the process of care and clinical outcomes within three high-risk clinical settings: the ED, ICU, and OR.

For each collaborative, national and regional regulatory and accreditation patient safety goals and priorities were aligned with clinically relevant outcomes and local priorities. A mosaic of stakeholders, experts, and funders supported each program. Collaborative resources and activities were offered without charge to participating hospital teams. Enrollment in the collaboratives was voluntary but required hospital chief executive officer commitment of in-kind resources and senior leadership support.

The ED Collaborative was offered by the Maryland Patient Safety Center, in partnership with the Maryland Chapters of the American College of Emergency Physicians and the Emergency Nurses Association. ED teams from 28 hospitals focused their efforts on improving patient safety by delivering appropriate and time-sensitive care to ED patients before and after clinical diagnosis. Multidisciplinary teams from each facility tested a variety of "change ideas" from the *ED Collaborative Improvement Guide*.[12] These change ideas represented a mix of systems and behavioral changes. For example, prediversion alert systems, an intervention usually led by a hospital administrator to ease crowding in the ED, not only improved flow but also affected the survey dimension of "Hospital Management Support for Patient Safety."

Outcomes measured by participants included delivery of time-sensitive care to patients with invasive infections (e.g., pneumonia, sepsis) or myocardial ischemia; reduction of catheter-associated bloodstream infections in central lines inserted in the ED; an overall decrease in ED length of stay; and improvement in a patient safety dimension measured by the AHRQ *Hospital Survey on Patient Safety Culture*.

The ICU and OR Collaboratives were offered to hospitals in the region through the *100,000 Lives and Beyond Collaborative* sponsored by CareFirst BlueCross BlueShield. The

collaborative was designed to provide hospitals with a vehicle for incorporating platforms from the national IHI *100,000 Lives Campaign* with existing local and national priorities.[13] Of the 28 hospitals that participated in the *100,000 Lives and Beyond Collaborative*, 26 hospitals enrolled teams in the ICU Collaborative, and 20 enrolled in the OR Collaborative. Multidisciplinary teams implemented evidence-based clinical interventions using change ideas from the *100,000 Lives and Beyond ICU and OR Collaborative Improvement Guide.*[14]

Outcomes measured by participants in the ICU Collaborative included incidence of invasive health care-associated infections (e.g., catheter-associated bloodstream infection, ventilator-associated pneumonia) and improvement in a patient safety dimension measured by the *Hospital Survey on Patient Safety Culture*. Culture improvement was embedded into several clinical improvement approaches. These included rounding in the ICU to plan daily goals for patients and to check compliance with the ventilator bundle, thereby impacting "Communication Openness" and "Teamwork Within Units," two of the survey dimensions.

Outcomes measured by participants in the OR Collaborative were focused on avoidable perioperative complications, including surgical site infections, venous thromboembolic events, and improvement in a patient safety dimension as measured by the *Hospital Survey on Patient Safety Culture*. Culture improvement was embedded into these efforts. For example, several OR teams added a line item on antibiotic timing to their "Time-Out" process, which is performed prior to surgery to verify the particulars of the procedure. This embedded the culture dimensions of "Communication Openness" and "Teamwork Within Units" into the antibiotic timing intervention and involved nurses, surgeons, and anesthesiologists.

All three collaboratives followed a framework adapted from the IHI Breakthrough Series model. Hospital teams participated in a series of three facilitated workshops that introduced evidence-based practices and implementation change ideas, as well as training in the application of rapid cycle improvement. Teams were encouraged to share successful strategies during the learning sessions and via facilitated calls held during interval action periods and through a community LISTSERV® and Web portal. Adaptations to the IHI model included executive sponsorship activities, skill training for team leads, on-site training visits, and inclusion of culture change goals.

Culture Improvement Resources and Interventions

The AHRQ *Hospital Survey on Patient Safety Culture* was used as both an intervention and a collaborative assessment tool. Measurement of patient safety culture at the start of each collaborative was used by the hospital teams to guide selection of a culture improvement goal. A *Culture Improvement Guide*[15] toolkit provided participating hospitals with comprehensive resources for understanding culture in patient safety and planning and implementing culture interventions.

The toolkit incorporates the five processes identified by Weick and Sutcliffe,[16] which high-reliability organizations apply to avoid and address unpredictable events. The Guide also includes a discussion and adaptation of the "Capability Maturity Model"[10] to the health care

quality improvement environment. The Model, which defines five stages to sustainable high performance, views culture as a reflection of the infrastructure of the organization.

The *Culture Improvement Guide* provides a framework for planning culture interventions and includes a table of interventions and resources, tying multiple culture interventions to the different dimensions of the culture survey. In total, the Guide[15] includes more than 50 ideas and approaches that can be applied to enhance communication, teamwork, and other aspects of organizational culture, with the goal that teams use their *Hospital Survey on Patient Safety Culture* results to guide them in selecting subsequent steps and approaches. Examples of interventions linked to the AHRQ patient safety culture dimensions appear in Table 1.

The first workshop for each collaborative included an overview of the purpose and application of the culture survey, along with a dedicated breakout session on culture change approaches. At that same workshop, facility- and collaborative-level results were distributed to each team. Using the reports, teams were able to compare the results for their facility with those of other teams and the average for the collaborative.

At the end of each collaborative program, which was November/December 2006 for the *100,000 Lives and Beyond Collaboratives* (OR and ICU) and March/April 2007 for the ED Collaborative, the survey administration process was repeated to provide an opportunity for remeasurement.

Table 1. Examples of interventions included in the culture improvement guide, by culture dimension

AHRQ culture dimension	Example of intervention
Overall perceptions of safety	Executive review of projects
Frequency of events reported	Unit-based error-reporting systems
Supervisor/manager expectations and actions promoting safety	Staff patient safety award
Organizational learning/continuous improvement	Root cause and failure mode and effects analyses
Teamwork within units	Implement SBAR technique
Communication openness	Safety briefings
Feedback and communication about error	Provide feedback about reported errors to staff
Nonpunitive response to error	Implement effective reporting systems
Staffing	Appoint a safety champion for every unit
Hospital management support for patient safety	Patient safety leadership walk rounds
Teamwork across units	Teamwork training
Hospital handoffs and transitions	Relay safety reports at shift change

Source: Culture Improvement Guide, Delmarva Foundation, 2006.
SBAR = Situation-Background-Assessment-Recommendation

ICU and OR hospitals participated in a postsurvey conference call to discuss the culture survey results.

Throughout the course of each collaborative, each participating hospital team communicated their project activities through monthly reports, site visits, events, phone calls, and other informal tracking mechanisms. These qualitative data allowed for tracking each team's progress in meeting the collaborative and team-selected goals. However, because each hospital team self-selected goals and multiple interventions, it is not possible to correlate their diverse culture initiatives with survey outcomes.

Methods

The following section describes the data collection and analysis methods used for this review.

Data Collection

The baseline AHRQ *Hospital Survey on Patient Safety Culture* was administered between October and November 2005 for all three collaborative groups. Improvement Leads, the collaborative team's operational lead, were responsible for the administration of the survey within their facility. Leads were given a packet of surveys to administer to all staff whose work affected patient care (e.g., clerks, doctors, nurses) in each respective unit. Some recommended approaches for administering the survey were to:

- Distribute the surveys at a department/staff meeting or educational session, providing pencils and return envelopes.
- Hand-deliver surveys to individual staff members/physicians with instructions on where and how to return the completed survey.

Improvement Leads maintained a copy of the completed surveys, tracked the number of surveys returned, and submitted the surveys and data to Delmarva via mail. Upon receipt, the surveys were entered into a database using a double-data entry process. Discrepancies were resolved by verifying the entry on the hard copy of the form.

Limitations in the survey distribution process included the inability to identify which distribution method was used for each hospital team; whether the same method was used for the baseline and followup surveys; and whether the same individuals participated in both surveys.

Analysis

Culture survey results were analyzed for each hospital that participated in the ED, ICU, and OR Collaboratives and completed a baseline and/or a followup survey. These data were analyzed separately for each collaborative group. Data from one hospital in the ICU Collaborative were removed because the hospital submitted only two surveys. Overall, 54 percent of hospitals had teams participating in more than one collaborative.

Characteristics of the facilities and respondents from hospitals participating in the three collaboratives were calculated using descriptive statistics. Hospital characteristics included bed size, urban/rural designation, and teaching affiliation. The characteristics of each hospital were obtained from the *American Hospital Directory*.[17] Respondent characteristics included profession. The mean and median number of respondents per hospital were provided, as well as the average response rate and percentage of hospitals that provided response rates.

Calculating Dimension Scores

The AHRQ *Hospital Survey on Patient Safety Culture*: *2007 Comparative Database Report*[18] provided guidelines on calculating scores for the 12 patient safety dimensions measured by this tool. Dimension scores for each collaborative were generated following a four-step process:

1. "Strongly agree" and "Agree" responses were identified for each question and indicated a positive response. When questions were reversed, a positive response was indicated with an answer of "Disagree" or "Strongly disagree."
2. For each hospital, the percentage of positive results for each question was calculated.
3. Dimension scores for each hospital were calculated as the average percentage of positive responses for each question within the dimension.
4. Collaborative dimension scores were then calculated by averaging the hospital dimension scores across each collaborative. Standard deviations were also calculated for each dimension score.

Comparisons

The baseline and followup dimension scores were compared for hospitals within each collaborative that completed both surveys. The relative change in each of the 12 dimension scores was calculated for each collaborative.

Improvement was defined as any increase in the average percentage of positive responses from baseline to followup. The percentage of hospitals improving in each dimension was based on this definition.

Within each collaborative, the dimension scores among hospitals completing both baseline and followup surveys were compared with those for hospitals completing only a baseline or followup survey. Tests were not performed for statistically significant differences in dimension scores over time or differences in dimension scores between collaboratives due to the exploratory nature of the study and the small sample size.

Results

Characteristics of Hospitals and Respondents

Use of the AHRQ *Hospital Survey on Patient Safety Culture* was high for all three collaboratives. During the collaborative intervention period, 26 hospitals in the ED Collaborative

(93 percent), 26 hospitals in the ICU Collaborative (100 percent), and 19 hospitals in the OR Collaborative (95 percent) completed at least one survey. However, although all hospitals in the ICU Collaborative participated in at least one survey opportunity, for purposes of the analysis one was removed due to a low number of surveys.

Facility characteristics for hospitals that completed both the baseline and followup surveys were compared with those for hospitals that completed only the baseline or followup survey. Facility characteristics studied included size (based on number of inpatient beds); hospital urban/rural designation; and hospital teaching affiliation. Facilities were defined as teaching hospitals or community hospitals based on their American Medical Association designation (Table 2).

In the ED Collaborative, 13 hospitals (50 percent) completed both surveys and 13 hospitals (50 percent) completed only the baseline survey. Hospitals from both groups were similar in size, urban/rural designation, and teaching affiliation. The distribution of respondents from hospitals completing both surveys was similar to that of hospitals completing only the baseline survey, with nurses being the most heavily represented group.

In the ICU Collaborative, 14 hospitals (56 percent) completed both surveys, 4 (16 percent) completed only the baseline survey, and 7 (28 percent) completed only the followup survey. Compared with hospitals completing both surveys, those completing the baseline survey only tended to be smaller, rural, and community nonteaching hospitals. Facilities completing only the followup survey were slightly smaller but more likely to be urban teaching hospitals. The distribution of respondents from hospitals completing both surveys was similar to that of hospitals completing only the baseline survey, with nurses being the most heavily represented group.

In the OR Collaborative, 12 hospitals (63 percent) completed both surveys, and 7 (37 percent) completed only the baseline survey. Hospitals completing only the baseline survey tended to be smaller, but were similar to hospitals completing both surveys in their urban/rural designation and teaching affiliation. The distribution of respondents from hospitals completing both surveys was similar to that of hospitals completing only the one survey, with nurses being the most heavily represented group.

Although all three collaboratives exhibited differences in the facility characteristics of hospitals completing both surveys compared with hospitals completing only a baseline or followup survey, there was no consistency in these trends across the collaboratives.

Among the subset of hospitals in each collaborative completing both the baseline and followup surveys, ED hospitals tended to be urban, community, nonteaching facilities with an average bed size of 208. ICU and OR hospitals were heavily skewed toward urban designations and more likely to be community nonteaching hospitals. The average bed size for the ICU and OR hospitals in this subset was 272 and 257 beds, respectively.

Although hospitals were asked to track survey response rates, submission of this information was inconsistent at baseline. Hospitals that completed only one round of the survey reported lower response rates than those that completed both the baseline and followup survey opportunities. At

the time of the followup survey, more hospitals submitted their response rates, which was likely due to improved tracking and followup on this data element.

Table 2 presents the response rate for each collaborative group. The overall cumulative response rate at baseline was 61 percent (with 46 percent of hospitals reporting), while at followup, the overall response rate was 65 percent (with 96 percent of hospitals reporting).

Qualitative data collected from collaborative tracking tools described in the Methods section indicate that reasons for failing to complete a followup survey were similar across all three collaboratives. The three most common reasons for not completing the followup survey were:

- Changes or vacancies among hospital personnel responsible for administering the survey.
- Hospital plans to conduct a hospital-wide survey in the near future.
- A perception that survey completion would be excessively burdensome for staff.

The seven hospitals in the ICU Collaborative that completed only followup surveys joined the collaborative after the baseline data collection had been completed.

Findings

As shown in Table 3, the AHRQ *Hospital Survey on Patient Safety Culture* dimension scores for all three collaboratives have been aggregated into a single overall score for each dimension. The overall dimension scores for hospitals completing both baseline and followup surveys are then compared with the overall baseline scores for hospitals completing only the baseline or followup survey.

The differences in overall dimension scores between hospitals completing both surveys and those completing only a baseline or followup survey ranged from 0 to 15 percent. Hospitals completing only a baseline survey had a lower safety score and scored lower in 11 of 12 (92 percent) of the patient safety dimension scores. Hospitals completing only a followup survey also had a lower safety score and scored lower in seven (58 percent) of the patient safety dimension scores. Standard deviation for the dimension scores of the baseline survey ranged from 9 percent to 22 percent. For the followup survey, they ranged from 7 percent to 21 percent.

Analysis of Patient Safety Dimension Scores Among Hospitals with Baseline and Followup Surveys

Overall and individual collaborative changes in patient safety dimension scores were analyzed for the subset of hospitals completing both baseline and followup surveys. These results are summarized in Table 4. Due to the small sample size in each collaborative group, it was not possible to determine statistical significance in the change from baseline to followup survey results. Therefore this discussion highlights the trends observed among the different collaborative groups and in the aggregate.

Table 2.   Respondent characteristics, by collaborative

Characteristics	Hospitals completing baseline and followup surveys		Hospitals completing only one survey	
	Baseline	**Followup**	**Baseline only**	**Followup only**
ED collaborative				
Total number of hospitals participating in survey	13	13	13	0
Average number of inpatient beds	208	208	229	–
Location (%)				
Urban	77	77	85	–
Rural	23	23	15	–
Type of hospital (%)				
Teaching	31	31	39	–
Community	69	69	62	–
Total number of respondents	656	470	376	–
Number of respondents per hospital				
Mean	51	36	29	–
Median	40	34	23	–
Response rates (%)				
Average response rate	71	63	52	–
Hospitals reporting response rates	46	100	62	–
Profession of respondent (%)				
Physician	15	13	13	–
Nurse	51	59	50	–
Other	35	28	37	–
ICU collaborative				
Total participating hospitals	14	14	4	7
Average number of inpatient beds	272	272	155	201
Location (%)				
Urban	86	86	50	100
Rural	14	14	50	0
Type of hospital (%)				
Teaching	36	36	25	57
Community	64	64	75	43
Number of respondents total	429	429	90	237
Number of respondents per hospital				
Mean	31	29	22	31
Median	27	28	21	37

Table 2.   Respondent characteristics, by collaborative (*continued*)

Characteristics	Hospitals completing baseline and followup surveys		Hospitals completing only one survey	
	Baseline	**Followup**	**Baseline only**	**Followup only**
Response rates (%)				
Average response rate	76	70		56
Hospitals reporting response rates	57	100	0	100
Profession of respondent (%)				
Physician	6	3	7	7
Nurse	64	64	62	66
Other	31	33	31	26
OR collaborative				
Total number of hospitals participating in survey	12	12	7	0
Average number of inpatient beds	257	257	217	–
Location (%)				
Urban	92	92	100	–
Rural	8	8	0	–
Type of hospital (%)				
Teaching	42	42	57	–
Community	58	58	43	–
Number of respondents total	524	536	175	–
Number of respondents per hospital				
Mean	44	45	25	–
Median	28	42	26	–
Response rates (%)				
Average response rate	52	67	59	–
Hospitals reporting response rates	42	83	29	–
Profession of respondent (%)				
Physician	13	6	8	–
Nurse	50	53	55	–
Other	38	41	37	–

Table 3. Percent (± SD) positive responses of aggregate dimension scores for hospitals completing a baseline or followup survey vs. those completing both surveys

Culture dimension	Baseline survey results [% (SD)]			Followup survey results [% (SD)]		
	Completed baseline only (N = 24)	Completed baseline & followup (N = 39)	Compared[a]	Completed followup only (N = 7)	Completed baseline & followup (N = 39)	Compared[a]
Safety grade (A/B vs. other)[b]	57 (22)	63 (18)	↓	47 (11)	55 (21)	↓
Overall perception of safety	51 (15)	54 (13)	↓	49 (12)	54 (18)	↓
Frequency of events reported	51 (16)	51 (10)	↑	51 (7)	49 (12)	↑
Supervisor/ manager expectations and actions promoting patient safety	69 (13)	74 (9)	↓	62 (12)	71 (12)	↓
Organizational learning/ continuous improvement	64 (15)	71 (9)	↓	66 (7)	71 (13)	↓
Teamwork within units	69 (15)	76 (11)	↓	78 (8)	77 (11)	↑
Teamwork across units	35 (13)	47 (13)	↓	47 (5)	45 (14)	↑
Communication openness	57 (9)	60 (10)	↓	56 (5)	59 (12)	↓
Feedback and communication about error	50 (15)	58 (13)	↓	49 (9)	58 (12)	↓
Nonpunitive response to error	34 (14)	36 (10)	↓	33 (8)	34 (12)	↓
Staffing	41 (16)	47 (13)	↓	50 (16)	45 (15)	↑
Hospital management support for patient safety	57 (16)	66 (12)	↓	47 (18)	62 (14)	↓
Hospital handoffs and transitions	37 (13)	43 (12)	↓	45 (11)	41 (11)	↑
Internal transitions	43 (16)	49 (13)	↓	54 (14)	47 (13)	↑
External transitions	31 (12)	37 (13)	↓	35 (10)	36 (10)	↓

N = Number of hospitals

a   Arrows denote whether the group completing one survey (either baseline or followup) scored lower (↓) or higher (↑) than the group that completed both surveys.

b   Positive responses for the Safety Grade included grades of A and B.

Table 4. **Percent (±SD) positive responses of aggregate dimension scores and relative change, by aggregate and collaborative group**

Culture dimension	Aggregate (N = 39)			ED collaborative (N = 13)			ICU collaborative (N = 14)			OR collaborative (N = 12)		
	Baseline % (±SD)	Followup % (±SD)	Rel chg %	Baseline % (±SD)	Followup % (±SD)	Rel chg %	Baseline % (±SD)	Followup % (±SD)	Rel chg %	Baseline % (±SD)	Followup % (±SD)	Rel chg %
Safety grade (A/B vs. Other)	62.5 (18.4)	54.6 (20.6)	-12.6	49.5 (16.1)	39.8 (24.2)	-19.5	69.2 (14.7)	59.8 (13.6)	-13.6	68.9 (18.0)	64.7 (14.2)	-6.1
Overall perception of safety	54.2 (13.1)	54.4 (17.9)	0.3	44.7 (9.5)	40.9 (18.6)	-8.5	56.6 (13.0)	56.0 (10.8)	-1.1	61.6 (11.2)	67.0 (14.2)	8.8
Frequency of events reported	50.7 (10.3)	48.9 (11.7)	-3.6	44.2(7.2)	41.1 (10.9)	-7.2	53.3 (12.1)	48.3 (8.7)	-9.4	54.7 (7.8)	58.1 (9.4)	6.2
Supervisor/ manager expectations and actions promoting patient safety	74.2 (9.2)	71.4 (11.7)	-3.8	69.8 (8.9)	66.0 (12.5)	-5.4	78.9 (7.8)	74.7 (11.6)	-5.3	73.4 (9.3)	73.4 (9.7)	-0.1
Organizational learning/ continuous improvement	71.4 (9.3)	71.2 (12.6)	-0.3	64.2 (6.2)	61.5 (13.1)	-4.2	77.2 (6.5)	77.4 (7.7)	0.3	72.6 (10.0)	74.5 (11.0)	2.6
Teamwork within units	76.3 (11.1)	76.8 (11.3)	0.6	73.5 (9.1)	70.4 (7.0)	-4.3	83.1 (10.9)	83.5 (11.0)	0.4	71.4 (10.0)	75.9 (11.6)	6.4
Teamwork across units	46.9 (13.0)	45.1 (13.5)	-3.8	38.2 (10.6)	33.7 (9.3)	-11.6	52.1 (11.8)	52.5 (13.7)	0.9	50.2 (12.8)	48.7 (8.9)	-3.0
Communication openness	59.6 (10.4)	59.3 (11.9)	-0.5	56.3 (10.8)	53.4 (12.0)	-5.2	64.0 (10.5)	63.8 (9.9)	-0.3	57.9 (8.6)	60.5 (12.1)	4.4
Feedback and communication about error	58.1 (12.8)	57.6 (12.5)	-1.0	49.2 (8.8)	49.9 (11.2)	1.4	63.2 (14.0)	62.4 (10.6)	-1.4	61.9 (10.1)	60.3 (12.7)	-2.5
Nonpunitive response to error	36.1 (10.4)	34.1 (12.5)	-10.4	31.8 (9.1)	29.5 (10.4)	-7.1	42.2 (6.9)	35.8 (12.1)	-15.3	33.7 (12.2)	37.3 (14.5)	10.7
Staffing	47.3 (13.3)	44.9 (14.8)	-5.0	40.7 (10.9)	36.8 (14.2)	-9.6	53.7 (12.9)	46.2 (12.3)	-14.0	46.9 (13.4)	52.3 (14.6)	11.4

Table 4. **Percent (±SD) positive responses of aggregate dimension scores and relative change, by aggregate and collaborative group (*continued*)**

Culture dimension	Aggregate (N = 39)			ED collaborative (N = 13)			ICU collaborative (N = 14)			OR collaborative (N = 12)		
	Baseline % (±SD)	Followup % (±SD)	Rel chg %	Baseline % (±SD)	Followup % (±SD)	Rel chg %	Baseline % (±SD)	Followup % (±SD)	Rel chg %	Baseline % (±SD)	Followup % (±SD)	Rel chg %
Hospital management support for patient safety	65.7 (12.4)	62.4 (14.5)	-5.0	57.6 (11.9)	51.4 (17.2)	-10.8	67.3 (11.4)	67.2 (7.8)	-0.1	72.6 (9.6)	68.8 (10.5)	-5.2
Hospital handoffs and transitions	43.2 (12.1)	41.1 (10.7)	-4.9	41.4 (7.7)	37.3 (10.7)	-9.8	49.8 (15.6)	47.9 (10.0)	-3.7	37.5 (7.5)	37.2 (7.9)	-0.9
Internal transitions	49.2 (12.8)	46.6 (13.3)	-5.2	46.7 (8.9)	42.6 (10.8)	-8.7	57.7 (14.8)	56.9 (13.2)	-1.5	41.9 (7.6)	39.1 (7.7)	-6.8
External transitions	37.2 (13.0)	35.5 (10.0)	-4.5	36.1 (8.4)	32.1 (11.7)	-11.2	41.8 (17.9)	39.0 (8.6)	-6.7	33.0 (8.9)	35.3 (9.0)	6.7

N = number of hospitals
Rel chg = relative change

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Table 5.   Percentage of hospitals improving per dimension, by collaborative group and aggregate

Culture Dimension	Hospitals Improving (%)			
	ED (N = 13)	ICU (N = 14)	OR (N = 12)	Aggregate (N = 39)
Overall perception of safety	38	57	92	62
Frequency of events reported	46	36	75	51
Supervisor/manager expectations and actions promoting patient safety	38	50	58	49
Organization learning/ continuous improvement	38	57	67	54
Teamwork within units	38	50	75	54
Teamwork across units	38	43	42	41
Communication openness	38	64	58	54
Feedback and communication about error	62	57	58	59
Nonpunitive response to error	38	29	58	41
Staffing	31	21	58	36
Hospital management support for patient safety	38	64	33	46
Hospital handoffs and transitions	31	50	58	46

N = number of hospitals

The highest scoring dimensions in both the baseline and followup survey results were Teamwork Within Units, Supervisor/Manager Expectations and Actions Promoting Patient Safety, and Organizational Learning/Continuous Improvement. These trends were consistent in each of the three collaboratives and overall. The lowest scoring dimensions in the baseline and followup survey results were Teamwork Across Units, Hospital Handoffs and Transitions, and Nonpunitive Response to Error. These trends were also consistent in each of the three collaboratives and overall.

A comparison of the baseline and followup survey scores suggests that overall improvement in survey patient safety dimensions was greater among OR teams than among ICU or ED teams. OR teams achieved an increase in positive responses for seven patient safety dimensions (58 percent), compared with three (25 percent) for ICU teams, and one (8 percent) for ED teams.

Two dimensions measured global perceptions of safety. The Safety Grade asks respondents to rate the overall safety in the unit. The Overall Perception of Safety dimension combines four questions that relate to processes and safety at the unit level. The Safety Grade decreased by 12.6 percent among the three collaboratives overall and by 19.5 percent in ED, 13.6 percent in ICU, and 6.1 percent in OR. The Overall Perception of Safety dimension was unchanged (+0.3 percent) among the three collaboratives overall, but variation among the collaboratives was

considerable. Perception of Safety decreased by 8.5 percent and 1.1 percent in the ED and ICU, respectively, but increased by 8.8 percent among the hospitals in the OR Collaborative.

Teamwork Within Units scored substantially higher than Teamwork Across Units at Baseline and followup among hospitals participating in each of the three collaboratives and overall. The overall score for Teamwork Within Units remained unchanged (+0.6 percent), whereas the overall score for Teamwork Across Units decreased (-3.8 percent). Variation in the changes in these domains among the three collaboratives was considerable. For Teamwork Within Units, hospitals in the ED Collaborative reported a decrease of 4.3 percent, while ICU hospitals were unchanged (0.4 percent), and OR hospitals reported a 6.4 percent increase in positive responses. For Teamwork Across Units, hospitals in the ED Collaborative reported a decrease of 11.6 percent, while ICU hospitals were unchanged (0.9 percent), and OR hospitals reported a 3.0 percent decrease in positive responses.

Questions within the Handoffs and Transitions patient safety dimension were divided into two subsets, one reflecting Internal Transitions and the other External Transitions. Although the Handoffs and Transitions dimension was among the lowest-scoring patient safety dimensions, hospitals within each of the three collaboratives and in aggregate rated *Internal Transitions* higher than External Transitions.

Hospital Improvement

Changes in individual patient safety dimension scores for hospitals participating in each of the three collaboratives were analyzed to judge how accurately collaborative averages reflected the changes experienced at the hospital level. Table 5 shows the percentage of hospitals in each collaborative demonstrating an improvement in individual patient safety dimensions. All together, 62 percent of hospitals reported an improved Overall Perception of Safety, with 38 percent of ED hospitals, 57 percent of ICU hospitals, and 92 percent of OR hospitals showing improvements.

Changes in Teamwork Within Units paralleled those seen in the Perception of Safety dimension. Overall, 54 percent of hospitals reported an improvement in this dimension, with 38 percent of ED hospitals, 50 percent of ICU hospitals, and 75 percent of OR hospitals showing improvements. A larger proportion of hospitals in all three collaboratives reported improvements in Teamwork Within Units (54 percent) than in Teamwork Across Units (41 percent). Changes in Teamwork Across Units were similar for the ED, ICU, and OR hospitals, with 38 percent, 43 percent, and 42 percent reporting improvements, respectively.

Discussion

Overall, 3,922 culture surveys were administered within the ED, ICU, and OR collaboratives at 38 distinct hospitals participating in three patient safety collaboratives administered by Delmarva Foundation in Maryland, the District of Columbia, and Northern Virginia from 2005 to 2007. Some hospitals participated in more than one collaborative. A subset of hospitals in each collaborative setting completed both baseline and followup surveys.

Analysis of facility characteristics among hospitals completing both surveys compared to those completing only a baseline or followup survey was conducted but did not identify any consistent trends. Respondents appeared to be similar in their staffing distribution.

However, the response rates and scores of hospitals completing only baseline surveys differed consistently from those completing both surveys. In all but one patient safety dimension, the baseline-only group scored lower than peers from hospitals completing both surveys. Exposure to blinded comparative data from all collaborative participants might have been perceived as discouraging by these hospitals. Alternatively, a diminished capacity to succeed in an improvement intervention generally geared toward "early adopters" may be reflected in their lower baseline patient safety dimension scores.

Response rates were higher for hospitals that completed both survey opportunities (61 percent at baseline and 65 percent at followup) and within each collaborative group, with the exception of the OR baseline-only group. In that case, only 2 hospitals provided response rates. Cumulative response rates were consistent with those reported by AHRQ in the *2007 Comparative Database Report,*[18] which published the results of 382 hospitals that applied the *Hospital Survey on Patient Safety Culture*. Among those facilities that used a paper-based survey, the overall average response rate was 62 percent.

The three collaborative programs included in this report targeted microsystem rather than hospital-wide culture and systems change. Our analysis of culture survey data at the ED, ICU, and OR microsystem levels suggests that participants were more likely to perceive a positive patient safety culture within their microsystem. Ratings of dimensions—such as Supervisor and Management Support, Overall Perception of Safety, and Teamwork Within Units—exceeded those of Teamwork Across Units, External Transitions, and Nonpunitive Response to Error. This appears to be consistent with the findings reported by AHRQ in the *2007 Comparative Database Report*.[18] Among the 382 hospitals, Teamwork Within Units (78 percent positive response) was the strongest dimension, while Nonpunitive Response to Error (43 percent positive response) scored the lowest.

There were substantial and unexpected differences among the three collaboratives in the direction and degree of improvement among the patient safety dimensions that had the most direct relationship with the collaborative interventions. These dimensions included Teamwork Within Units and the internal components of the Handoffs and Transitions dimension. In the ICU, "team" includes more individuals from outside of the unit, such as pharmacy and respiratory therapy personnel. In the ED, "team" includes many staff members working in various locations – triage, main ED, urgent care, and others – indicating that the concept of teamwork within the ED may be much more dynamic.

External transition scores decreased from baseline to followup survey for the ED and ICU teams, while they increased for OR teams. ORs tend to conduct handoffs with a limited number of units. For ORs, handoffs are limited to postanesthesia care units or, in some cases, ICUs. The number of handoffs is larger for the ICU and even greater for the ED. Qualitative data indicate that the increase in positive perceptions of external handoffs in the OR is related to the limited number of units involved in handoffs, compared with those involved in handoffs in the ICU or ED.

All three collaboratives were similar in terms of design, recruiting and enrollment criteria, supporting materials, facilitator experience and expertise, and improvement methodologies. In some cases, there was even an overlap of team members. All three collaboratives demonstrated improvement in clinical and/or process measures, but it was not possible to correlate these to improvements in patient safety culture dimensions.[19, 20]

In the aggregate, 50 percent or more of all hospitals participating in both the baseline and followup surveys improved in 7 of 12 patient safety dimensions. ORs demonstrated the most improvement overall in terms of the aggregate patient safety dimension scores, with more than half of the participating hospitals improving in 10 of 12 dimensions. ICUs exhibited moderate improvement in the overall dimension scores, with 50 percent or more of participating hospitals improving in eight dimensions. EDs demonstrated a general reduction in overall dimension scores, with one dimension in which 50 percent or more of the participating hospitals improved.

Given the timeline of the application of the culture survey, it is difficult to determine whether areas where teams exhibited a movement toward the negative indicate a worsening of culture, response to external factors, or an enhanced awareness of patient safety culture issues. A number of factors may have contributed to the trends in culture scores, and the time between baseline and followup surveys, as well as limited qualitative data, may have been insufficient for a full analysis of culture.

Conclusion

Perceptions of culture and change patterns following interventions measured by the AHRQ *Hospital Survey on Patient Safety Culture* among hospitals participating in three uniformly designed collaboratives are consistent with recent studies indicating that organizational culture may vary among hospital units, and that culture change efforts may best be tailored to the unit level.[21] Mohr, et al.[22] have noted that health care organizations exhibit variations at the microsystem levels, and that these different microsystems are important units to involve in improving patient safety. Creating a culture of safety within microsystems is identified as one of the key principles for safety within a clinical microsystem.[23]

Within the three collaboratives, the voluntary administration of the *Hospital Survey on Patient Safety Culture* was high among participating facilities. Qualitative tracking suggests that application of the assessment tool was well received among participants. While patient safety dimensions more closely linked with collaborative interventions, such as Teamwork Within Units, were more robustly affected than other dimensions, the direction and factors influencing those changes are not easily identified. Further qualitative study would add granularity and internal confirmation of these trends. The component questions for the Handoffs and Transitions dimension were grouped as internal and external to the microsystem and indicate that perceptions of safety differ between the two groupings.

The scope of the survey's patient safety dimensions was broader than the areas naturally associated with the clinical outcomes targeted by each collaborative. Hospitals using low positive response rates for specific patient safety dimensions as a guide for selecting their collaborative culture intervention may have found themselves challenged by the lack of overlap

between the culture focus and clinical objectives. For example, collaborative teams often selected Nonpunitive Error Reporting, a frequently identified dimension with a low rate of positive responses at both baseline and followup, as a focus area because of the low perceptions at baseline. However, this patient safety deficiency was not well aligned with collaborative clinical objectives heavily weighted toward infection prevention, teamwork, and improved flow.

The highest value of the AHRQ *Hospital Survey on Patient Safety Culture* remained at the microsystem level and not as a tool for measuring overall collaborative performance. Averaging patient safety dimension scores at an aggregate level obscured highly variable improvement trends experienced by hospitals in the three different collaborative settings. Therefore, it is important to examine the hospital-level improvement by dimension as in Table 5.
It has been suggested that safety culture perceptions could be considered a complementary, or perhaps a proxy measure, for outcomes and processes related to patient safety.[24] Because positive responses related to culture varied by dimension and microsystem, there is a need for further research in this area. In addition, it will be helpful to see the report of the second year of the comparative database from hospitals using the *Hospital Survey on Patient Safety Culture* to see how hospitals shift over time in their patient safety culture scores and to better understand what rate of change in scores hospitals can expect to see over time.

Further analysis is required for examining differences in scores for academic vs. community settings, physicians vs. nurses, and rural vs. urban settings.

Acknowledgments

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