

## Patient Safety

# Using a Multihospital Survey to Examine the Safety Culture

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**T**he 2000 Institute of Medicine report *To Err Is Human*, brought the subject of medical error to widespread public attention.<sup>1</sup> It increased interest within medicine about finds that demonstrated high levels of safety, such as manufacturing, aviation, and nuclear power.<sup>2-4</sup> The safety of these so-called high-reliability organizations has been attributed in part to the existence of organizational cultures that support the safety mission.<sup>5-10</sup> As a result, creating a safety culture in health care organizations is heralded as a promising, but as-yet unproven, error-reduction strategy.<sup>11-13</sup>

To characterize the features of a safety culture in health care, researchers have begun to study the perspectives of health workers. In a seminal study of operating room and intensive care clinicians, for example, Sexton and colleagues showed dramatic differences in the perceptions of nurses, residents, and attending physicians in surgery and anesthesiology regarding performance with regard to fatigue, communication, and teamwork.<sup>14</sup> In another study, Singer and colleagues surveyed workers at 15 California hospitals about the safety culture.<sup>15</sup> They documented problematic responses, particularly among front-line workers, to questions about a variety of issues, including workers' ability to provide safe care, the commitment of senior leaders to patient safety goals, and the likelihood of being disciplined for making mistakes.

These pioneering studies documented an environment in many hospitals that may undermine efforts to promote safe patient care. Further research is needed to validate findings and to correlate survey results with improvements in patient safety. Accordingly, we undertook a study to address the following four objectives:

## Article-at-a-Glance

**Background:** A culture of safety survey was used to study features of the safety culture and their relationship with patient safety indicators.

**Study Design:** Anonymous written surveys were collected from 455 of 1,027 (44%) workers at four Massachusetts hospitals. Respondents characterized their organizations' patient safety, workplace safety, and features of a safety culture, such as leadership commitment, professional salience, presence of a nonpunitive environment, error reporting, and communication.

**Results:** Employees universally regarded patient safety as an essential part of their job. Two-thirds of workers worried at least once a day about making a mistake that could injure a patient; 43% said that the work load hindered their ability to keep patients safe. Workers' overall assessment of patient safety was associated with their perceptions of workplace safety (odds ratio [OR] 1.87, 95% confidence interval [CI] 1.02-3.43,  $p = .044$ ) and leadership commitment to patient safety (OR 3.20, 95% CI 1.97-5.19,  $p < .001$ ). Incident reporting rates correlated with survey results, while adoption of best practices and expert opinion did not.

**Discussion:** Patient safety is salient to workers, who universally embraced patient safety as an essential part of their job. Independent indicators of patient safety did not line up neatly with safety culture survey results. Incident reporting rates correlated directly, while adoption of best practices and expert opinion varied inversely with survey results. The safety culture is a complex phenomenon that requires further study.

1. To characterize the culture of safety at four hospitals in Massachusetts
2. To determine whether the culture varied across and within hospitals and between professional groups
3. To identify factors associated with workers' overall assessments of patient safety
4. To learn whether hospitals with strong safety cultures would also have corroborating evidence of safe care

## Methods

### Study Sites

The study took place at three community hospitals (41–256 beds each) and a 582-bed academic medical center that were members of CareGroup, an integrated health care delivery system in eastern Massachusetts.

CareGroup undertook a comprehensive medication reliability initiative from 1999 through 2001.<sup>16–17</sup> The organization created interdisciplinary hospital-based teams and deployed 16 Massachusetts Hospital Association (MHA)-identified best practices in medication safety using rapid-cycle quality improvement techniques.<sup>18</sup>

### Instrument Development

To assess hospitals' progress in fostering a safety culture, we developed a written survey of front-line employees in 1998. We used a search engine to find English-language articles with the terms *organizational culture*, *hospitals*, and *health care organizations*. We also used computerized social science library databases to search for articles in business management and industrial safety, using the terms *safety culture*, *organizational culture*, and *high-reliability organization*.

Published surveys of organizational culture in health care were too broad for our purposes or not readily applicable to quality improvement and patient safety.<sup>19–24</sup> We reviewed the results of a U.S. Department of Veterans Affairs (VA)-sponsored focus group study of workers at CareGroup, Kaiser Permanente, and the VA.<sup>25</sup> The focus group study, which found no significant differences across organizations, documented front-line workers' skepticism about leaders' commitment to the safety mission and documented workers' broad interpretation of the term *safety*.

Informed by these sources, we built a survey instrument for front-line workers that assessed the following four aspects of a safety culture:

1. **Leadership.** Do workers believe that patient safety is a high priority to senior leaders?
2. **Salience.** Do workers believe that patient safety is a relevant and important part of their job? Do they feel personally responsible for ensuring safe patient care?
3. **Nonpunitive environment.** Are workers afraid that they will be punished for making mistakes?
4. **Reporting and communication.** Are workers willing to report errors, and if so, to whom? Will workers challenge a senior clinician's plan in order to keep patients safe?

Next, we created questions about workers' attitudes, behaviors, and experiences with respect to each aspect of a safety culture. We included an additional question about workplace safety and global assessments of quality and safety. The number of questions was limited by our desire to create an instrument that could be administered in a variety of clinical settings (for example, staff meetings, conferences, change of shift) and completed within 10 minutes.

The survey used a 5-point Likert scale and binary (yes/no) responses. It included 34 questions that fit on the front and back of a single page. To assess its clarity and face validity, the survey was pilot-tested with 3 groups of 5 to 10 persons each ( $N = 21$  medical house officers). Surveys were administered anonymously and respondents were debriefed about their interpretations of questions and responses. Medication reliability team leaders at each CareGroup hospital also reviewed the original instrument; we incorporated suggestions to clarify ambiguous wording. To test the reliability of the instrument, we readministered the survey to 36 staff members of one hospital unit 2 months after the initial administration. Use of Student's *t*-test to compare group means revealed no statistically significant difference between initial and follow-up responses to any question.\*

### Survey Administration

The instrument was provided to medication reliability team leaders at each hospital, who arranged for the survey to be administered at their institutions. Other than cosmetic changes (for example, identification of room to which to return completed surveys, telephone number of

\*The survey instrument is available from Dr. Weingart by request.

a local contact), surveys were identical in the four sites—with one exception. At one small hospital, leaders elected to remove questions about respondents' age, sex, and employment tenure to ensure anonymity.

Printed surveys were distributed to nurse and pharmacy managers and to physician leaders and were then administered anonymously and collected at the change of shift and during staff meetings between December 2000 and June 2001. At the medical center, surveys were administered on the oncology and neonatal intensive care units and to staff pharmacists. Surveys were delivered to medication reliability team leaders, who forwarded them to the investigators for data entry and analysis.

## Independent Safety Indicators

To corroborate survey responses, we compared the results with other indicators of patient safety. We considered the following measures as possible indicators of safe care:

1. The number of MHA medication safety best practices completed within the three-year initiative (more is better)
2. The time (that is, number of months required) for each hospital to complete 80% of the MHA best practices (fewer is better)
3. The number of medication-related events per 1,000 patient days reported in each hospital's incident reporting system (more is better, assuming that reporting is an indicator of effective communication and a nonpunitive environment<sup>20</sup>)
4. The percentage change in the incident reporting rate from January 1999 to January 2000 (more is better)
5. A priori ranking of the patient safety program at each hospital by the medical director and consultant to the systemwide medication reliability initiative. Each measure is presented as an ordinal rank (1 is best, 4 is worst).

## Data Analyses

In analyzing the data, we attempted to create indices by combining responses to questions about aspects of the safety culture, such as leadership, salience, nonpunitive environment, and reporting, but Cronbach's alpha (reliability) scores were poor. We selected individual questions from the survey for analysis on the basis of their face validity. We used Fisher's exact test and the Kruskal-Wallis statistic for intra- and interhospital comparisons and for comparisons between professional groups. We

created a multivariable logistic regression model with backward elimination ( $p < .2$ ) to study the association between respondents' global rating of patient safety and survey responses, controlling for respondents' assessment of workplace safety, site, professional group, and respondents' demographic characteristics (sex, years employed at the hospital). Age was omitted as a covariate due to collinearity with employment tenure. We compared ordinal ranking of hospitals by safety culture survey with adoption of medication safety best practices, incident reporting rates, and leaders' implicit judgments of patient safety at each hospital.

## Results

### Response Rates

We received 455 completed surveys (Table 1, page 128). Response rates varied by hospital (31%–53%) and were 44% overall. Nursing was the professional group most heavily represented among respondents (45% overall), but this also varied by hospital (30%–64%,  $p < .001$ ). Women comprised 88% of respondents. Respondents at Hospital 2 were younger and had worked fewer years than those at Hospitals 3 and 4.

### Survey Responses

Table 2 (page 129) shows the responses to each question by hospital and in total.

### Leadership

A majority of respondents agreed that senior managers regarded patient safety as a high priority (64% overall, range 56%–87%,  $p < .001$ ), a result consistent with the inclusion of medication safety as one of five CareGroup corporate goals. Nevertheless, leaders did not meet workers' expectations for sharing information about adverse events. Nearly half (48%, range 32%–68%,  $p < .001$ ) disagreed with the statement that the hospital regularly provided staff with information about errors and injuries.

### Salience

Workers endorsed the salience of patient safety to their work. Ninety-six percent of respondents (no significant interhospital difference) agreed that ensuring patient safety was an essential part of their job. Although

**Table 1. Culture of Safety Survey Respondents, by Hospital\***

	Hospital 1		Hospital 2		Hospital 3		Hospital 4		Total		p value
	n	%	n	%	n	%	n	%	N	%	
All respondents, rate	47	43.9%	70	31.4%	141	53.4%	197	45.5%	455	44.3%	< .001†
Total possible	107		223		264		433		1,027		
All nurse respondents, rate	30	30.9%	38	29.7%	78	34.7%	59	54.6%	205	36.7%	.362‡
Total nurses	97		128		225		108		558		
Job title											< .001†
Nurse	30	63.8%	38	54.3%	78	55.3%	59	29.9%	205	45.1%	
Physician	9	19.1%	10	14.3%	8	5.7%	4	2.0%	31	6.8%	
Pharmacist	3	6.4%	11	15.7%	1	0.7%	10	5.1%	25	5.5%	
Manager	0	0.0%	0	0.0%	16	11.3%	1	0.5%	17	3.7%	
Other	3	6.4%	0	0.0%	23	16.3%	78	39.6%	104	22.9%	
Not reported	2	4.3%	11	15.7%	15	10.6%	45	22.8%	73	16.0%	
	47		70		141		197		455		
Gender											.976†
Male	NA	NA	8	12.9%	13	11.5%	17	11.3%	38	11.7%	
Female	NA	NA	54	87.1%	100	88.5%	134	88.7%	288	88.3%	
			62		113		151		326		
Mean years at hospital, SD	NA	NA	8.2	6.7	13.4	10.3	9.4	8.9	10.6	9.3	.001‡
Mean age, SD	NA	NA	36.6	8.9	45.6	8.8	44.8	10.2	43.2	10.3	.001‡

\* NA, not available; SD, standard deviation.  
 † Fisher's exact test.  
 ‡ Kruskal-Wallis statistic.

few respondents acknowledged having made errors that contributed to serious injury (5%, range 4%–9%,  $p = .491$ ), making mistakes was on the minds of many respondents. Fourteen percent worried about making mistakes that might harm patients on a daily basis, and an additional 50% worried about making mistakes all the time. Respondents' worry was likely driven, in part, by their heavy work load. Forty-three percent said that their work load interfered with the ability to keep patients safe.

**Nonpunitive Environment**

Although the organization had committed itself to a nonpunitive approach to patient safety improvement, respondents split evenly on the question of whether employees who injure patients should be disciplined, with substantial variation across hospitals (33% overall, range 18%–43%,  $p = .002$ ). A minority of respondents (24%, range 19%–28%,  $p = .348$ ) said that an employee who accidentally injured a patient would be placed on probation or disciplined.

**Reporting and Communication**

Respondents distinguished among different ways to report errors. A majority indicated that they would

complete an incident report (79%, range 75%–89%,  $p = .117$ ). Many would tell a supervisor (75%), talk with the patient's physician or nurse (75%), or speak with a nurse manager (63%), but few would discuss an error with friends or colleagues (29%), report the incident to an outside or government agency (13%), or mention concerns to the patient or family (13%; data available from authors). Respondents at Hospital 2 were significantly more likely to talk to the patient's physician or nurse, to discuss an error with friends or colleagues, and to mention their concerns to the patient and family than respondents at other facilities.

To understand more about patient safety communication, we asked respondents about their willingness to challenge a more senior colleague. Forty-two percent of respondents (range 34%–78%,  $p < .001$ ) had told a more senior clinician that their diagnostic or treatment plan posed a risk to patient safety.

**General Assessments**

Finally, we asked respondents about their overall rating of quality of care, patient safety, and occupational safety.

Forty-six percent of respondents rated the quality of care at their hospitals better than at other local hospitals (range 40%–79%,  $p < .001$ ), 33% rated patient safety better (range 27%–66%,  $p < .001$ ), and 81% agreed that reasonable precautions were in place to create a safe workplace (range 76%–94%,  $p = .006$ ).

**Differences in the Safety Culture Across Hospitals**

Table 2 shows statistically significant differences across hospitals for 7 of the 13 questions. The differences were consistent among questions related to leadership and general assessments of quality, patient safety, and worker safety. There were no significant interhospital differences among questions regarding salience.

**Table 2. Culture of Safety Survey, by Hospital\***

Question	Hospital 1 n = 47		Hospital 2 n = 70		Hospital 3 n = 141		Hospital 4 n = 197		Total n = 455		p value
	n	%	n	%	n	%	n	%	n	%	
<b>Leadership</b>											
<i>Is patient safety a priority to senior managers?</i>											
Very high/high	40	87.0%	45	64.3%	94	68.1%	105	56.1%	284	64.4%	< .001†
Low/very low	1	2.2%	7	10.0%	10	7.2%	29	15.5%	47	10.7%	
<i>The hospital provides staff with information about errors.</i>											
Strongly agree/agree	20	42.6%	12	18.2%	57	44.9%	35	21.1%	124	30.5%	< .001†
Disagree/strongly disagree	15	31.9%	45	68.2%	42	33.1%	93	56.0%	195	48.0%	
<b>Sentience</b>											
<i>Is patient safety an essential part of your job?</i>											
Definitely/probably	46	97.9%	47	100.0%	140	100.0%	171	91.9%	404	96.2%	.289†
Probably not/definitely not	0	0.0%	0	0.0%	0	0.0%	8	4.3%	8	1.9%	
<i>Have you made an error that caused a serious patient injury?</i>											
Yes	4	8.5%	3	6.5%	6	4.4%	7	4.1%	20	5.0%	.491†
No	41	87.2%	40	87.0%	127	94.1%	159	93.0%	367	92.0%	
<i>How often do you worry about making a mistake that might harm a patient?</i>											
All the time	27	57.4%	28	41.2%	70	52.2%	87	48.9%	212	49.6%	.594†
Once a day	7	14.9%	20	29.4%	16	11.9%	16	9.0%	59	13.8%	
Once a week	4	8.5%	13	19.1%	11	8.2%	15	8.4%	43	10.1%	
Monthly	0	0.0%	3	4.4%	8	6.0%	22	12.4%	33	7.7%	
Almost never	9	19.1%	4	5.9%	29	21.6%	38	21.3%	80	18.7%	
	47		68		134		178		427		
<i>Does your work load interfere with keeping patients safe?</i>											
Definitely/probably	23	50.0%	21	45.7%	60	43.5%	73	40.3%	177	43.1%	.114†
Probably not/definitely not	12	26.1%	10	21.7%	35	25.4%	73	40.3%	130	31.6%	
<b>Nonpunitive Environment</b>											
<i>Employees who injure patients by making mistakes should be disciplined.</i>											
Strongly agree/agree	18	38.3%	12	18.2%	33	25.8%	77	42.5%	140	33.2%	.002†
Disagree/strongly disagree	16	34.0%	27	40.9%	47	36.7%	47	26.0%	137	32.5%	
<i>What would happen to a worker who accidentally caused a serious patient injury?</i>											
Placed on probation or disciplined	10	21.3%	13	18.6%	31	22.0%	55	27.9%	109	24.0%	.372†
Not placed on probation or disciplined	37	78.7%	57	81.4%	110	78.0%	142	72.1%	346	76.0%	
<b>Reporting and Communication</b>											
<i>If you made an error, would you complete an incident report?</i>											
Yes	38	80.9%	62	88.6%	111	78.7%	148	75.1%	359	78.9%	.117†
No	9	19.1%	8	11.4%	30	21.3%	49	24.9%	96	21.1%	
<i>Have you told a more senior clinician that the plan was unsafe?</i>											
Definitely/probably	36	78.3%	33	47.8%	46	33.8%	66	36.7%	181	42.0%	< .001†
Probably not/definitely not	0	0.0%	19	27.5%	59	43.4%	73	40.6%	151	35.0%	
<b>General</b>											
<i>How does quality at your hospital compare with other hospitals?</i>											
Much better/better	37	78.7%	38	54.3%	56	40.6%	76	39.6%	207	46.3%	< .001†
Worse/much worse	0	0.0%	1	1.4%	2	1.4%	9	4.7%	12	2.7%	
<i>How does patient safety at your hospital compare with other hospitals?</i>											
Much safer/safer	31	66.0%	24	34.3%	38	27.7%	52	27.1%	145	32.5%	< .001†
Less safe/much less safe	0	0.0%	3	4.3%	5	3.6%	5	2.6%	13	2.9%	
<i>Is your hospital a safe workplace for employees?</i>											
Definitely/probably	44	93.6%	53	75.7%	119	85.0%	151	77.4%	367	81.2%	.006†
Probably not/definitely not	1	2.1%	11	15.7%	6	4.3%	16	8.2%	34	7.5%	

\* Questions have been abbreviated to fit table.  
 † Kruskal-Wallis statistic.  
 ‡ Fisher's exact test.

Hospital 1 workers tended to provide positive responses, while Hospital 4 workers tended to provide more negative responses, but this varied by question.

Because the composition of respondents by professional group varied among hospitals, we investigated the possibility that this might confound differences across

organizations. We repeated the hospital-level analysis using data from the 205 nurse respondents alone. Statistically significant differences persisted in 5 of 13 questions, including all the questions related to leadership and general assessments of quality and safety. The ordinal relationship among hospitals in the percentage of positive responses was also preserved (Hospital 1 > Hospitals 2 and 3 > Hospital 4).

### Differences Within a Hospital

To examine intrahospital differences in the safety culture, we compared the oncology and neonatal intensive care units at the medical center. The units are identified as Units A and B to preserve their anonymity. There was no statistically significant difference in the mean age, sex distribution, job tenure, and percentage of nurse respondents between the units.

We found statistically significant differences between units in response to two questions. Unit A staff were more likely than Unit B staff to identify patient safety as a high priority to senior leaders (83% versus 50%,  $p = .002$ ) and to have challenged more senior clinicians about unsafe plans (74% versus 29%,  $p = .001$ ). Unit A's acknowledgment of patient safety as a leadership priority may reflect this unit's more active and sustained engagement in the CareGroup medication safety initiative. Unit A participated in several early

hospital-sponsored patient safety initiatives, including an enhanced incident reporting project in which the nurse manager elicited information about adverse drug events and near-miss errors at staff meetings. Also, the Unit A medical, nursing, and pharmacy staffs participated in a series of medication projects to improve the reliability of medication ordering, which ultimately led to the development of a prototype electronic order entry system. Unit B, a more self-contained and autonomous entity within the medical center, joined the hospital-sponsored effort later in its course. In analyses limited to the 38 nurse respondents, Unit A staff were more likely than Unit B staff to identify patient safety as a high priority (73% versus 44%,  $p = .066$ ) and to have challenged more senior clinicians (73% versus 26%,  $p = .016$ ).

#### Differences Between Professional Groups

We found few differences between the responses of nurses, pharmacists, and physicians, although the small number of nonnurse clinicians reduced the power of this analysis. Nurses (50%) and pharmacists (38%) were more likely than physicians (29%) to agree that work load interferes with their ability to keep patients safe ( $p = .030$ ). Nurses (92%) and pharmacists (84%) were also more likely than physicians (74%) to complete incident reports ( $p = .004$ ), but physicians (48%) were substantially more likely than nurses (12%) or pharmacists (4%) to mention concerns about errors to the patient and family ( $p < .001$ ).

#### Factors Associated with Patient Safety

We created a multivariable logistic regression model to identify survey questions associated with workers' global assessments of safe patient care. Leadership commitment to patient safety (odds ratio [OR] 3.20, 95% confidence interval [CI] 1.97–5.19,  $p < .001$ ) and workplace safety (OR 1.87, 95% CI 1.02–3.43,  $p = .044$ ) were the only factors associated with workers' judgment that patient safety at their hospital compared favorably with other local facilities.

#### Independent Indicators of the Safety Culture

Finally, we examined the relationship between indicators of organizational patient safety performance and results of the safety culture survey (Table 3, page 131). Paradoxically, respondents' ratings of patient safety,

quality of care, and workplace safety were inversely related to adoption of best practices and expert opinion in ordinal rankings. Hospital rank by incident report, in contrast, more closely matched survey results.

#### Discussion

Creating a culture of safety is a widely heralded goal, but the concept of safety culture is elusive. To better characterize the features of the safety culture, we studied the responses of Massachusetts health care workers to an anonymous written survey.

We found several striking results. First, patient safety is salient to workers. Employees universally embraced patient safety as an essential part of their job, and two thirds of workers worried at least once a day about making mistakes that could injure patients. Workers' worry may be motivated by the belief that clinicians should be disciplined for making mistakes and that the work load undermines their ability to keep patients safe.

Second, workers' overall judgment of patient safety was related strongly to their perceptions of workplace safety and leadership commitment to patient safety. This result underlines the value of a genuine and highly visible leadership commitment to the safety of both patients and workers. It suggests that worker safety may be a prerequisite to patient safety improvement, perhaps by modeling the organization's commitment to safety in general.<sup>27,28</sup>

Third, independent indicators of patient safety did not line up neatly with safety culture survey results. Incident reporting rates correlated directly, while adoption of best practices and expert opinion varied inversely with survey results. These findings suggest the implausible conclusion that safety culture and safety improvements are independent phenomena. More likely, the findings illustrate the difficulty of creating robust safety indicators. High incident reporting rates are an ambiguous measure, signaling either the presence of a culture that supports error reporting or an unsafe environment. Expert opinion is an implicit and potentially unreliable judgment. And best practices may be implemented expeditiously in organizations with undeveloped safety cultures.

Our results are consistent with Singer et al.'s culture survey of workers at 15 California hospitals.<sup>16</sup> Problematic (that is, negative) responses were common in Singer

**Table 3. Ordinal Ranking of Culture Survey and Patient Safety Indicators**

	Hospital 1	Hospital 2	Hospital 3	Hospital 4
<b>Survey</b>				
Patient safety	1	2	3	4
Quality of care	1	2	3	4
Workplace safety	1	4	2	3
<b>Safety Indicators</b>				
<b>Adoption of best practices</b>				
Total no. completed (range, 9–13 practices)	3	1*	4	1*
Time to adopt 80% (range, 24–35 months)	3*	2	3*	1
<b>Incident reporting</b>				
Rate/1,000 patient-days (range, 2–15)	1	4	2	3
Percentage change in rate from 1999 to 2000 (range, –63%–455%)	1	2*	2*	4
Expert opinion	3	2	4	1

\* Ties.

et al.'s study (4%–52% on individual questions) and ours (2%–48%). Similar questions elicited similar responses. For example, respondents in both studies expressed concern about their ability to provide safe care (33% versus 32% here), the commitment of senior leaders to patient safety goals (15% versus 11% here), and the likelihood of being disciplined for making mistakes (28% versus 33% here). However, Singer et al. reported greater consistency across hospitals in response to individual questions (up to 22% spread versus up to 44% here). We identified statistically significant differences across hospitals in questions related to leadership commitment and global safety assessments.

Our results also departed from Sexton et al.'s surveys of operating room and intensive care clinicians, which showed dramatic differences in the perceptions of nurses, residents, and attending physicians.<sup>14,20,30</sup> In contrast, we found few differences between professional groups. The interprofessional differences in Sexton et al.'s work may be accentuated by the high-stress environments and specialties studied.

The present study is subject to several limitations. First, it is possible that bias was inadvertently introduced in the decentralized survey distribution and collection process that was organized by local patient safety leaders. On the other hand, the method reflects standard practice in hospital quality improvement and may provide a realistic benchmark. Although lower than desired, our response rate (44%) was comparable to that found in Singer et al.'s study (47%), which used more intensive survey collection methods. Our response rate

may underestimate the true rate because local team leaders did not track or exclude from the denominator workers who were sick, temporarily disabled, or on vacation. Second, we had relatively few nonnurse respondents, which reflects the staffing pattern at the hospitals and the difficulty of enlisting physician respondents. The small numbers decreased the statistical power of interprofession comparisons. Third, responses to certain questions may be difficult to interpret.

For example, willingness to communicate against an authority gradient may indicate the presence of a safety culture. However, we do not know if those who failed to challenge senior clinicians encountered no unsafe plan or if respondents failed to speak up. Fourth, the study took place in a hospital system that was publicly committed to medication safety improvement. This emphasis on safety may have led to better results in several dimensions (for example, leadership, salience, reporting) but may limit the generalizability of the results.

Further studies are needed to address unanswered questions about the safety culture in health care.<sup>31</sup> Can safety cultures be influenced by policies and practices? If safety cultures can be built, what tools are available to health care leaders? What is the relationship between safety culture survey results, safe practices, and adverse events? The safety culture is a complex phenomenon that merits further inquiry. ■

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