Patient Safety Climate: A Study of Southern California Healthcare Organizations

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EXECUTIVE SUMMARY

Human error remains the most important factor in unnecessary deaths and suffering in U.S. hospitals. Human error results from healthcare providers' attitudes and behaviors toward patients in different settings. Therefore, taking periodic snapshots of the attitudes and behaviors prevalent in an organization and manifested in its patient safety climate (PSC) is essential.

We developed and tested a short survey instrument intended as an organization-level measure of PSC with good psychometric properties that can be used in hospitals, clinics, or other healthcare provider settings. Analysis of data from 61 Southern California healthcare organizations resulted in a PSC model with four distinct, reliable factors: (1) Assistance From Others and the Organization, (2) Leadership Messages of Support in Policy and Behavior, (3) Resources and Work Environment, and (4) Error Reporting Behavior. A PSC score, ranging from 0 to 100, was generated for each organization.

For a subsample of hospitals in our study, preliminary results indicate a predictive quality of the model. The higher the PSC score, the lower the number of violations detected by the Centers for Medicare & Medicaid Services in complaint inspections, and the fewer the safety problems reported by The Leapfrog Group.

Given the association between PSC and health outcomes, we urge healthcare leaders to use various means, such as our survey, to monitor the degree to which their organizations maintain a climate that fosters patient safety and use such data to pinpoint areas for improvement.

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INTRODUCTION

One study estimates that more than 400,000 people die unnecessarily in U.S. hospitals every year because of healthcare provider errors (James, 2013), and 11 million may die unnecessarily in the decade to come (Levitt, 2014). The average annual cost of preventable medical errors in hospitals nationwide has been about $29 billion (Institute of Medicine, 2000). The U.S. healthcare industry has invested in technology, training, and systems to reduce human error, yet problems persist. Looking at patient safety from different angles is important (Farup, 2015), and no single training tool or assessment instrument will be sufficient to safeguard patient well-being in today's complex and changing healthcare settings.

While concern for patient safety is inherent in the healthcare professions, acknowledging, measuring, and managing a climate of patient safety are relatively recent developments. Healthcare's increased attention to the phenomenon will likely continue to be driven by regulations for Medicare reimbursements under the Affordable Care Act (ACA) (Hacker & Walker, 2013). Under the ACA, hospitals may no longer be reimbursed for preventable readmissions of discharged patients within 30 days, so healthcare leaders have a financial incentive to identify the causes of care-delivery errors and address variables that lead to preventable readmissions. The federal government and private sources are making information publicly available regarding healthcare providers' quality and safety, further driving consumer awareness of healthcare environments. Ratings and rankings of hospitals are now published in magazines such as *Consumer Reports* and *U.S. News and World Report*. Thus, healthcare managers are increasingly interested in evidence-based tools and approaches that help them achieve improved patient outcomes and safety records and, consequently, the organization's reputation (Birk, 2015; Kurtzman, 2015; Weaver et al., 2013).

Patient safety can be jeopardized by many factors, including infrastructure and technology (Holden, 2011; Wachter, 2012). This research, however, centers on the variables that foster patient safety and on creating a survey instrument to measure an organization's climate, which indicates its underlying culture based on behavioral and attitudinal perspectives. We define patient safety climate (PSC) as a set of shared values and practices that prioritize patient safety, whereby safety-enhancing behaviors are not only expected, but expected to be exhibited to a high degree. This definition is in line with previous research drawing on shared perceptions and behaviors to assess the PSC (Hughes, Chang, & Mark, 2009).

Given the continued suffering and costs associated with unsafe healthcare environments (Levitt, 2014), creating and maintaining a climate that fosters patient safety must remain a top priority for healthcare leaders. This priority is especially acute in the context of managing organizational change, when cultural climate shifts may be advantageous or detrimental to the perception and reality of patient safety. On the other hand, an organization's capacity to absorb and sustain changes related to improving patient safety may depend on the established culture at work (Kash, Spaulding, Gamm, & Johnson, 2013). The assessment of the PSC before,

during, and after change implementation may provide healthcare leaders with important information regarding desired cultural transitions. With increased advocacy for comprehensive, whole-system changes in their organizations (Toussaint, 2015), healthcare managers need to assess the PSC regularly alongside other organizational dimensions to achieve a broad view of the associated issues and opportunities for improvement. Our study offers one empirically generated tool for doing so.

BACKGROUND

Although the vast literature on patient safety and relevant cultures (Parker, Wensing, Esmail, & Valderas, 2015; Singer, Falwell, et al., 2009; Wachter, 2012; Waterson, 2014) undoubtedly informed our research, we focus here on key aspects specific to the development of our PSC assessment. To complement the PSC definition stated earlier, we clarify the difference between often-conflated notions of organizational culture and climate, note the history of safety climate research and its PSC variant, and provide a review of selected assessment tools and a conceptual framework for our study.

Organizational Culture and Climate

Organizational culture shapes, and is shaped by, the way in which work groups attempt to solve problems. Behaviors found to be successful are usually repeated and taught to new organizational members (Schein, 2010). While culture is seen as an enduring construct, organizational climate is considered to be a temporary manifestation—a snapshot—of an underlying culture. Schneider, White, and Paul (1998) described organizational climate as the shared perceptions of members about the organization's policies, procedures, and practices, as well as what gets rewarded in the organization. In addition, climate may include behaviors typically exhibited by employees, and the climate can worsen or improve over time. Therefore, changes in organizational climate may be susceptible to changes in policies, practices, and rewards, as well as the behavior demonstrated by organizational leaders.

Keyton (2014) remarked that "climate is the text of an organization, whereas culture is the subtext," and studies of organizational climate "tend to focus on individual employees' attitudes and feelings (that are aggregated to some level) of a variety of organizational behaviors and characteristics" (p. 132). Research has converged on two primary ways in which individual members of an organization come to share meaning about their organization: social interaction and leadership behaviors (Ostroff, Knicki, & Tamkins, 2003; Schneider & Reichers, 1983; Zohar & Hofmann, 2012). If meaning is socially constructed, then it is through social interaction that members of a group make sense of their observations and behaviors. Meaning is determined by "the interplay between one's own perceptions and those of others in the same situation" (Zohar, 2010, p. 1519). Over time, the different perceptions of group members tend to fuse as individuals influence each other and the organizational culture. Determining meaning in the organization is an ongoing, interpretive process (Weick, 2012), and so should be the assessment of organizational climate.

Organizational members must make sense of the words and behaviors of their supervisors and the organization's

leaders (Zohar & Hofmann, 2012). When supervisors' and leaders' behaviors are ambiguous (or contradict policy or oral statements), organizational members may seek out others to make sense of these discrepancies. Such discrepancies may be mitigated in part by an ongoing assessment of organizational policies, procedures, or practices. In an analysis of 21 studies, Bronkhorst, Tummers, Steijn, and Vijverberg (2015) suggested that healthcare organizations would "benefit from incorporating organizational climate factors in their health and safety policies" (p. 254). Whether the shared perceptions of organizational climate are rooted in social interaction or leadership behaviors and practices, the need for continuous assessment of this climate is evident.

Patient Safety Climate

Safety climate research began approximately 35 years ago in the manufacturing industry as a result of concerns about workplace accidents. Zohar (1980) and others began identifying employees' shared perceptions about certain characteristics of the environment related to safety. Zohar (2003) noted that a safety climate constitutes the shared perceptions of organizational members about the importance of safety compared with other organizational priorities. Several studies have shown that safety climate scores predict both objective and subjective safety outcomes in different industries (Christian, Bradley, Wallace, & Burke, 2009). Zohar (2010) reviewed three decades of safety climate research, and highlighted the achievement of "an enormous task of validating safety climate as a robust leading indicator or predictor of safety outcomes across industries and countries" (p. 1517).

One type of safety climate is unique to healthcare organizations: PSC. According to the Institute of Medicine's (2000) foundational report, a safety climate is created through these cultural and structural attributes of organizations:

1. The actions management takes to improve both patient and worker safety
2. Worker participation in safety planning
3. The availability of appropriate protective equipment
4. The influence of group norms regarding acceptable safety practices
5. The organization's socialization process for new personnel

PSC research has drawn on these components and descriptors of organizational culture that contribute to patient safety, and some assessments have also incorporated national cultural differences (Singer & Vogus, 2013). Workplace cultures that exhibit the above practices are presumed to have a better safety climate. Differences in leadership behaviors or availability of resources and training affect the PSC, and cultures known for higher levels of engagement and encouragement also have higher indicators of PSC (Armstrong, Laschinger, & Wong, 2009; McFadden, Stock, & Gowen, 2015). Armstrong et al. (2009) surveyed 300 nurses in acute hospital settings and found that they felt empowered by support for their professional practice, recognition for doing a good job, and involvement in decision-making. Strong perceptions of empowerment directly related to the

climate of patient safety. Hospital cultures in which an environment of trust and open communication between leaders and employees has been developed and cultivated also have been associated with an increased awareness around patient safety (Auer, Schwendimann, Koch, De Geest, & Ausserhofer, 2014). Specifically, the "ease of reporting, unit norms of openness, and participative leadership are positively related to staff perceptions of patient safety climate" (Zaheer, Ginsburg, Chuang, & Grace, 2015, p. 13).

Some of the interest in PSC research is based on the nationally driven patient-safety agenda from organizations such as the National Patient Safety Foundation (www.npsf.org) that focus on common threats (e.g., medication and diagnostic errors, hospital-based falls, and infections). These outcomes are often attributed to the behaviors of organizational members providing care, a lack of training and support, and breaches in communication. One state health authority in Australia summarized these difficulties: "Measuring and improving the safety climate can be challenging as it involves such factors as values, beliefs, people, and practices" (VMIA, 2015).

PSC Assessment

Several tools have been created over the years to address these challenges. Singer et al. (2007), for instance, described the development and validation of a 38-item PSC survey (with an additional six demographic questions). The survey was geared toward hospital settings and examined differences in employee perceptions of safety culture. The survey results indicated that direct-care nurses were more attuned than physicians to patient safety considerations and "safety deficiencies in the organizational infrastructure" (Singer, Gaba, et al., 2009, p. 30).

The Safety Attitudes Questionnaire was originally designed to measure commercial aviation crew attitudes and was adapted for inpatient settings and later transformed into a 62-item ambulatory-setting version (Modak, Sexton, Lux, Helmreich, & Thomas, 2007). Because of some challenges with longer PSC surveys (e.g., usability of resulting data), the Canadian PSC survey (Can-PSCS), based in part on Zohar's work in safety climate, was a brief, 19-item instrument with robust psychometric properties (Ginsburg, Tregunno, Norton, Mitchell, & Howley, 2014). Its development and testing occurred in a publicly funded, universal healthcare system in Canada; and the success of Can-PSCS has not been consistently replicated in other systems, "perhaps owing to unique country characteristics, types of health systems, samples, [and] cultural differences" (Ginsburg et al., 2014, p. 2).

Recognizing the need for numerous changes to its widely used 2004 Hospital Survey on Patient Safety Culture (HSOPSC), the Agency for Healthcare Research and Quality (AHRQ, 2016) has been working on a new survey to be released in 2018. Based on a decade of feedback from surveyed hospitals, some key changes in this comprehensive assessment of safety climate pertain to bridging the divide between clinical and nonclinical personnel's understanding of survey questions, broadening the survey's appeal and translatability of questions for international audiences, and reducing the instrument's complexity and length. Although HSOPSC and some other popular instruments have

"safety culture" or "safety attitudes" in their titles, they are usually considered to be measuring safety climate (Agnew, Flin, & Mearns, 2013; Colla, Bracken, Kinney, & Weeks, 2005; Jackson, Sarac, & Flin, 2010; Soh, Barker, Moreno, Dalton, & Brand, 2016). A constant evolution and diversity of approaches and applications characterize the development of patient safety culture and climate assessment tools, which is projected to continue for years to come (Farup, 2015).

Conceptual Framework

The leadership, culture, and organizational technologies (LCOT) framework (Kash et al., 2013) fits with our research review because of its practical relevance for managing change. Measuring cultural readiness for change is at the heart of LCOT, and we view any reliable PSC assessment as a gauge of readiness for patient safety improvements. Specifically, the LCOT model relies on measuring the absorptive capacity for change—the ability to discover and exploit innovation, across and within healthcare organizations (Kash et al., 2013). Zahra and George (2002, p. 186) defined this capacity as a "set of organizational routines and processes by which firms acquire, assimilate, internalize, and exploit knowledge to produce a dynamic organizational capability." The model's other two components—leadership and organizational technologies—are also culturally and structurally embedded in leadership behaviors (e.g., promoting cooperation and generating alternatives [Hazy, 2008]) and organizational tools and processes (e.g., communication systems and training [Gamm, Kash, & Bolin, 2007]). At the intersection of related work routines and behaviors lies employee sense-making about

- employees' and managers' reliance on mutual commitment to resolution of patient safety concerns,
- positive messaging and action modeling for patient safety,
- a developmental environment that enables adequate training, and
- transparency and knowledge exchange regarding errors.

Because healthcare leaders must ensure that any innovation or transformation is not detrimental to patient safety (Holden, 2011; Naylor, Aiken, Kurtzman, Olds, & Hirshman, 2011), PSC assessments—within the LCOT framework—might provide useful indicators when determining absorptive capacity for change toward a safer healthcare setting.

Our review of the literature and existing PSC assessment instruments led us to focus on the following aspects: (1) the willingness of organizational members to ask for (and receive) reliable assistance when facing a difficult situation with implications for a patient's safety; (2) the prominence of patient safety in organizational leaders' policies and messages (e.g., when safety is competing with other organizational priorities); (3) the extent to which the training and work environment ensures that employees can provide quality care and are knowledgeable about safety practices and policies; and (4) the extent to which employees are encouraged to discuss and report errors and other detriments to patient safety. Our incorporation of these four factors into our framework is summarized next.

Factor 1: Assistance From Others and the Organization (ASST)

This variable captures the extent to which employees perceive that their efforts to ensure patient safety are supported by the organization, and that they can rely on and receive assistance from managers and coworkers when faced with difficult situations. As Singer, Falwell, et al. (2009) showed, effective teamwork and help-oriented group dynamics may characterize a culture in which patient safety is in focus. Factor 1 also correlates with the LCOT model's cultural attribute of teamwork commitment.

Factor 2: Leadership Messages of Support in Policy and Behavior (LMS)

All employees receive mixed messages because organizations typically have competing values (Stock, McFadden, & Gowen, 2007). A mixed message is sent, for example, when organizational leaders prioritize one goal over another in situations where the achievement of both appears to be in conflict (e.g., safety versus productivity). According to Zohar (2010), "From an employee standpoint, it is the overall pattern and signals sent by the complex web of rules and policies across competing domains that ultimately must be sorted out in order to discern what role behavior is expected, rewarded, and supported" (p. 1518). To the extent that managers consistently model and reward pro-safety behavior, the message they are sending is quite strong. The LMS variable encompasses both the organizational policy (Bronkhorst et al., 2015) and leaders' communication and behaviors regarding patient safety.

Factor 3: Resources and Work Environment (RWE)

This variable captures employees' perceptions that the work environment is conducive to learning about, making decisions toward, and behaving appropriately with regard to patient safety. In addition, the organization provides employees with sufficient resources—primarily training—to perform their jobs effectively. Most validated PSC assessments (e.g., Singer et al., 2007) include a section measuring the availability of appropriate resources. Aimed at both cultural and technological resource availability, RWE focuses on training and ease of acquiring skills to promote patient safety.

Factor 4: Error Reporting Behavior (ERB)

Systematic reporting and recording of errors is essential to understand and address threats to patient safety. The ability to report these potential threats and the cultural norms pertaining to open communication have been associated with perceptions of a better PSC (e.g., Zaheer et al., 2015). When employees feel safe reporting their errors and bad decisions, work teams and managers obtain an accurate account of events and are better able to address and minimize these behaviors in the future. On the other hand, in organizations in which errors are not always reported (or perhaps are covered up), taking appropriate corrective action is difficult. Therefore, this variable focuses on the organization's behavioral and structural transparency regarding communication of errors.

These four factors reflect the need for employees to feel free to request support, make decisions, innovate, and generally do the right things to perform their

jobs effectively. Similar elements have been theorized to contribute to the cultural notion of workplace empowerment, which has been validated as a predictor of PSC (Armstrong et al., 2009). Specific to leadership styles in healthcare settings, McFadden et al. (2015) stated that "transformational leaders are said to transform the organization by empowering followers through inspirational motivation efforts and encourage innovation, which is required for creating a safety climate" (p. 25). Organizations must demonstrate flexibility in navigating competing values to improve patient safety. Similarly, Stock, McFadden, and Gowen (2010) expected that a cultural "flexibility orientation, which includes group and developmental culture types, would be related to better patient safety outcomes" (p. 12).

Consequently, we set out to develop and validate a PSC assessment to capture these aspects, and our resulting survey is a simple, 22-item psychometric scanning tool from a U.S.-based, organizational-level perspective.

METHODS

Our research was iterative in nature and intertwined data collection, analysis, and sample refinement by design. In seeking to assess an organizational-level PSC, we wanted to sample nurses with direct-care responsibilities because they likely would be well attuned to patient safety concerns in their organizational environments.

Our research plan was to obtain completed surveys from three key informants from 50 healthcare organizations. Following our literature review, we generated 70 potential items. Using a 5-point Likert scale, two subject matter experts (SMEs) then rated these items for applicability to patient safety. We eliminated items that were not readily understood by the SMEs and those that received a score of 3.0 or below. A pilot study was then carried out with a group of 32 students in a doctoral program for nurse practitioners. An initial factor analysis and reliability analyses led us to retain 38 items.

From March to August 2014, we administered the 38-item survey to a convenience sample of multiple key informants at 67 healthcare organizations in Southern California. A total of 274 individuals completed surveys, well above our initial goal of 150. The survey asked respondents to specify their present job in the organization and check a box if they had regular, direct contact with patients. We excluded surveys that did not specify "registered nurse" or "nurse practitioner" as well as "direct contact" with patients. In addition, we established a minimum tenure of 3 years at the organization to ensure that respondents were well acquainted with its culture and could assess the current climate. Thus, we excluded surveys from respondents who indicated they had less than 3 years' tenure.

To assess organizational climate, data were first analyzed for within-group consensus (e.g., sufficient agreement among respondents from the same organization to justify aggregation). Insufficient agreement among key informants suggests very different perceptions of the organization by employees. We expected all organizations to satisfy three criteria for inclusion: (1) an interclass correlation coefficient (average measures) of 0.7 or above (Landers, 2011); (2) an interrater within-group agreement measure—r*WG(J)—of 0.7 or

above (Kozlowski & Hattrup, 1992); and (3) an average deviation index (AD_{MJ}) with a statistical significance of $p < .05$ (Smith-Crow & Burke, 2003). Rather than "averaging out" differences of opinion when aggregating the data, we eliminated from the study any organization whose key informants had insufficient agreement. Six organizations were thus eliminated, resulting in an effective sample of 61 healthcare organizations.

We used an exploratory factor analysis to determine which preliminary survey items would load into the conceptual model from the literature review. This model contained the following four factors (i.e., variables), as described earlier:

- *Factor 1:* ASST
- *Factor 2:* LMS
- *Factor 3:* RWE
- *Factor 4:* ERB

To determine how well the proposed model fit the data, we then subjected the model to a confirmatory factor analysis using structural equation modeling in AMOS (IBM SPSS, Armonk, NY). We wanted to determine if there was justification for aggregating the model's factors into one PSC score, and a possibility to compare aggregate, organizational-level scores with any established, independently measured indicators of healthcare quality and safety. For example, The Leapfrog Group (2015) conducts a survey of several hospital safety practices and produces a biannual score, which is publicly available. Several hospitals in our sample are included in The Leapfrog Group's survey. Similarly, the Centers for Medicare & Medicaid Services (CMS) recently filed safety inspection reports on several hospitals in our sample. These reports are publicly available (Association of Health Care Journalists, 2015).

RESULTS

Our final sample included 61 healthcare organizations and 268 key informants. For these 61 organizations, the interclass coefficient (average measures) ranged from .716 to .945 ($p < .05$), $r*WG(J) \geq 0.70$, and $AD_{MJ} < 1.167$. Thirty organizations were hospitals, and 31 were clinics or healthcare centers without a hospital facility. Respondents' tenure ranged between 3 and 34 years (mean, 9.79 years, standard deviation [*SD*], 8.16 years). All respondents were registered nurses or nurse practitioners with direct patient contact. Respondents' sex was not identified. To ensure that each organization contributed equally, we conducted subsequent analyses using the mean score for each organization. Table 1 presents the number of items, scale reliabilities, means, standard deviations, and correlations for all variables in the study.

Exploratory Factor Analysis

The mean scores for the 61 organizations on the 38-item survey were subjected to an exploratory factor analysis (principle components with equamax rotation), which suggested that 22 items loaded on four factors with Eigenvalues greater than 1, explaining 78.6% of the variance in the data (Table 2). The internal consistency reliability of the four scales exceeded Nunnally's (1978) 0.70 minimum.

Figure 1 shows the 22 items in our revised instrument we called the California PSC Survey (Cal-PSCS). The items corresponded to the four distinct concepts

TABLE 1
Means, Standard Deviations, Scale Reliabilities, and Intercorrelations for All Study Variables

Variable	*n*	No. of items	Scale α	*M*	*SD*	Pearson correlations 1	2	3	4	5	6	7	8	9
1. PSC Index	61	4	0.843	70.59	16.17	1								
2. ASST	61	8	0.903	4.03	0.70	.840[b]	1							
3. LMS	61	5	0.851	4.16	0.75	.804[b]	.604[b]	1						
4. RWE	61	4	0.839	3.66	0.88	.867[b]	.656[c]	.589[b]	1					
5. ERB	61	5	0.788	3.45	0.79	.796[b]	.557[b]	.486[b]	.580[b]	1				
6. Tenure	61	—	—	9.79	8.16	.246	.084	.258[d]	.215	.245	1			
7. Violations	9	—	—	6.22	5.47	−.678[d]	−.281	−.237	−.752[d]	−.713[d]	−.087	1		
8. LF_ Problems[a]	20	5	0.729	−.023	0.66	−.477[d]	−.090	−.143	−.616[c]	−.60[c]	−.030	.876[c]	1	
9. LF_ Positives[a]	20	3	0.619	−.043	0.87	.360	.126	.311	.489[d]	.288	.248	−.314	−.106	1

Note. ASST = Assistance From Others and the Organization; ERB = Error Reporting Behavior; LF = Leapfrog; LMS = Leadership Messages of Support in Policy and Behavior; PSC Index = Patient Safety Climate Index; M = Mean; n = number; RWE = Resources and Work Environment; SD = standard deviation.
[a] Items are *z* scores. [b] Correlation is significant at the .001 level (2-tailed). [c] At the .01 level. [d] At the .05 level.

TABLE 2
Exploratory Factor Analysis of Patient Safety Climate Items

Factor	1	2	3	4
ASST_08	.768			
ASST_10	.750			
ASST_09	.721			
ASST_18	.700			
ASST_11	.685			
ASST_05	.662			
ASST_06	.566			
ASST_02	.556			
LMS_19		.830		
LMS_15		.786		
LMS_22		.643		
LMS_01		.615		
LMS_07		.587		
RWE_12			.830	
RWE_17			.707	
RWE_14			.703	
RWE_13			.635	
ERB_21				.767
ERB_03				.738
ERB_04				.595
ERB_20				.560
ERB_16				.507

Note. Rotated component matrix is shown. Extraction method = principal component analysis; rotation method = equamax with Kaiser normalization.

in our model: (1) ASST, (2) LMS, (3) RWE, and (4) ERB.

Confirmatory Factor Analysis and the PSC Index

We found that the model fit the data well. Figure 2 presents the path diagram of a confirmatory factor analysis with four factors and the latent variable "patient safety climate." Goodness of fit indexes (GFIs) suggest a robust model with four variables and a latent variable corresponding to the overall construct "patient safety climate": $\chi^2 = .250$ ($p < .01$), GFI=.998, normed fit index = .997, root mean square error of approximation = .000, root mean square residual = .05. Therefore, we aggregated the four factors into an overall score by calculating a PSC Index, ranging from 0 to 100. From our data, PSC indexes ranged from 35.6 to 98.75 (mean [*SD*] = 70.59 [16.17]). The internal consistency reliability of the PSC Index was $\alpha = .843$.

Comparing Our Results With Violations Reported by CMS

We identified the number of violations reported by CMS in complaint-based inspections of hospitals in 2014. Reports were available for nine hospitals in our data set. When more than one report was filed during this period, we consulted the most recent report. We opted to use the total number of violations as a proxy for a patient safety outcome measure. For the nine hospitals, the number of violations ranged from 1 to 15 (mean [*SD*] = 6.22 [5.47]).

These results provide initial evidence of the predictive validity of the model, as the PSC Index negatively predicted the number of hospital violations: the higher the PSC Index score, the lower the number of violations ($R^2 = .459$, $p = .045$, standardized beta = −.678). Moreover, two of the PSC variables (ERB and RWE) were negatively correlated with the number of violations reported, as shown in Table 1.

Comparing Our Results With the Leapfrog Group Hospital Survey Data

The Leapfrog Group (2015) measures 28 safety aspects, 10 positive and 18 negative. Data were available for 20 hospitals in our sample. We tested all data in the study,

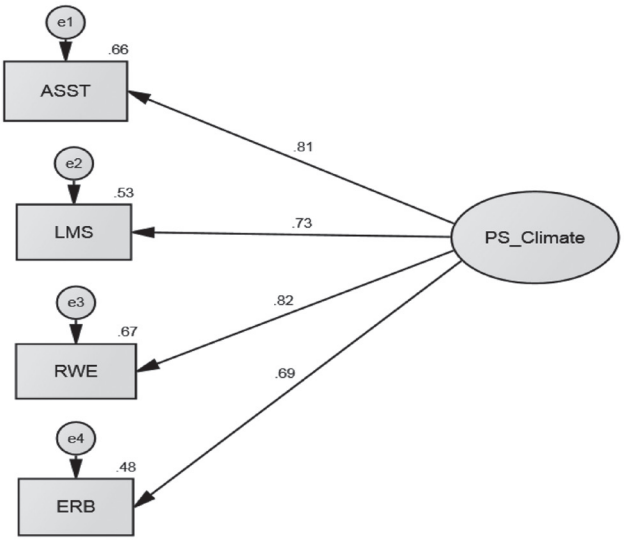
FIGURE 1
Items From the California Patient Safety Climate Survey

LMS_01.	Management consistently encourages everyone to report any errors or unsafe work behavior.
ASST_02.	In this organization, we do not hesitate to notify management or coworkers that we need help.
ERB_03.	Staff usually report their bad decisions to their managers and teams.
ERB_04.	This organization provides sufficient resources for staff to report problems with the safety of patients.
ASST_05.	The training we receive appropriately prepares us for our duties.
ASST_06.	This organization is dedicated to assisting staff in improving the quality of service delivered.
LMS_07.	The CEO and managers of this organization emphasize the importance of practicing safety measures.
ASST_08.	Most employees are fully aware of all the appropriate channels of communication between coworkers and management.
ASST_09.	In this organization, staff and managers are readily available for assistance.
ASST_10.	When staff members are unsure of policies or assignments, they usually consult their managers or coworkers.
ASST_11.	When I am not sure what to do, I can easily approach management and coworkers for assistance.
RWE_12.	This organization frequently offers training to help improve employees' skills.
RWE_13.	This organization instills confidence in its staff.
RWE_14.	This organization encourages all employees to attend nonmandatory training.
LMS_15.	There is a policy for dealing with medical errors, patient complaints, staff concerns, and patient safety.
ERB_16.	Coworkers usually report their errors and mistakes to their managers and teams.
RWE_17.	The training we receive in this organization meets my expectations for patient safety.
ASST_18.	People who work here get enough assistance to ensure patient safety.
LMS_19.	This organization has a clear policy on reporting medical errors.
ERB_20.	In this organization, all employees are informed about any errors or mistakes that occur at the workplace.
ERB_21.	People here are not afraid of reporting errors or patient complaints.
LMS_22.	Management has made it clear how to report medical errors, patient complaints, and patient safety.

including the Leapfrog data, for skewness and kurtosis. Eight of the Leapfrog Group measures indicated skewness and kurtosis within the acceptable range of −2.0 to +2.0, and were retained; all other measures were excluded from the study. We standardized the Leapfrog scores to overcome the problem of different measurement scales, typically representing the number of times a problem occurred per a specified number of patients. We used mean *z* scores to create two variables. Five negative items were included in a scale we called LF Problems (α = .73); these included problems with collapsed lungs, death from serious treatable complications, urinary tract infection during a stay in the intensive care unit (ICU), surgical site infection after colon surgery, and dangerous bed sores. We also included three positive items in a scale we called "LF Positives" (α = .62); these items were specially trained physicians for patients in the ICU, effective leadership to prevent errors, and physicians order medication via a computer.

The PSC Index negatively predicted LF Problems (R^2 = .228, p = .033; standardized beta = −.477). While the direction of the

FIGURE 2
Confirmatory Factor Analysis, Patient Safety Climate



Note. Goodness of fit index = .998; normed fit index = .997; root mean square error of approximation = .000; root mean square residual = .005.

relationship between the PSC Index and LF Positives was positive, the equation was not significant. Two PSC variables were negatively correlated with LF Problems: RWE ($r = -.616$, $p = .004$) and ERB ($r = -.606$, $p = .005$). The PSC variable RWE was positively correlated with LF Positives ($r = -.489$, $p = .029$).

DISCUSSION

We developed a short, general, organizational-level measure that may be used to assess PSC in healthcare organizations. Results indicate that the four-factor PSC model is reliable and a good fit with the data from the 22-item Cal-PSCS. These findings also offer initial evidence of the predictive validity of the model. Given the importance of patient safety and the cost to healthcare organizations of poor patient safety outcomes, healthcare leaders must continually assess their organizational climates and track changes over time, as well as in comparison with those of other organizations.

Healthcare managers can use the four PSC dimensions to identify strengths and weaknesses in their organization's PSC. Consistent with the LCOT framework of Kash et al. (2013), they also can assess the organization's cultural readiness for change toward a safer environment.

We share the vision of researchers and practitioners that healthcare organizations will continue to use multiple means of evaluating PSC. For instance, AHRQ offers several patient safety culture survey tools for different healthcare settings (e.g., hospitals, medical offices, pharmacies) and a number of non-English versions for international use. AHRQ's surveys are used around the world, alongside other tools to

aid in planning or evaluating patient safety programs (Parker et al., 2015). In revising the core HSOPSC survey, AHRQ acknowledges challenges in administering fairly complex or lengthy assessments, translating survey items for international use, and achieving uniformity of interpretation across clinical and nonclinical personnel (AHRQ, 2016).

Farup (2015) compared the administration of a Norwegian version of the HSOPSC in two similar medical departments, and found that a higher number of patients experienced adverse events in the department with significantly better patient safety culture scores (independently measured by a review of patient records). This unexpected finding prompted Farup to question "the reliability and validity of the tools used for measuring the patient safety culture and the adverse events" (p. 3). At the same time, this finding confirms the importance of work context and robust psychometric properties of the tools used for interpretation of results.

In developing the Cal-PSCS, we took into consideration the challenges of complexity and uniformity of appeal as well as the challenges of establishing clear boundaries for the organizational settings and levels of analysis. While the AHRQ surveys may be more useful in planning comprehensive patient safety programs (Jones, Skinner, Xu, Sun, & Mueller, 2008), our Cal-PSCS can be used by a healthcare organization for a quick diagnosis of its current, overall PSC. We envision that our instrument will be used primarily in U.S.-based healthcare settings, and recommend it be administered for the purpose of attaining an organization-level snapshot of the patient safety culture (hence, use of climate as a fitting descriptor). Within these limitations, we are encouraged by the positive signs of support for our approach, as reflected in organization-level reports from CMS and The Leapfrog Group. Although we were unable to share our findings with all organizations in the study, most study informants previewed the organization-specific results, and their feedback has been positive.

In their systematic literature review, Hessels and Larson (2016) identified multiple studies from 2000 to 2014 suggesting that PSC survey factors relate positively to healthcare worker behaviors, and that PSC improvements may enhance adherence to standard precaution practices in acute care hospitals. Hessels and Larson reviewed high-quality research with "data from self-report surveys including validated PSC measures or measures of management support and leadership" (p. 349). As a self-report survey with validated psychometrics, our PSC instrument—when used in a continuum of patient safety improvement efforts—might, therefore, also be helpful in improving the safety of healthcare work environments.

We look forward to future research that may lead to additional evidence of the instrument's validity. We also look forward to generating enough data to provide useful benchmarks for comparison over time within the same organization, as well as with a set of external organizations. Contrary to expectations, we found only one significant difference between hospitals and clinics: the LMS variable (mean difference = .537, p = .004; Table 3). Although this finding suggests that our instrument may be applicable to both types of organizations, significant differences between hospitals and clinics may be revealed in

TABLE 3
Mean Differences Between Hospitals and Clinics

Variable	*N*	*M*	*SD*	Mean difference	*p* Value
PSC Index					
Hospitals	30	73.1	13.9	4.933	.235
Clinics	31	68.2	18.0		
ASST					
Hospitals	30	4.03	.645	.0127	.944
Clinics	31	4.02	.76		
LMS					
Hospitals	30	4.43	.46	.537	.004
Clinics	31	3.9	.89		
RWE					
Hospitals	30	3.86	.694	.395	.080
Clinics	31	3.46	1.01		
ERB					
Hospitals	30	3.37	.83	−.156	.445
Clinics	31	3.53	.76		
Tenure					
Hospitals	30	11.61	10.32	3.568	.094
Clinics	31	8.04	4.86		

Note. N = total number; M = mean; SD = standard deviation.

future studies with a larger sample. Specific to the LCOT model's key goal of measuring absorptive capacity for change, we are intrigued with the continued discussion about the value of differentiating climate based on PSC level (i.e., averaged score) and strength (i.e., degree of agreement between responders) (Ginsburg & Gilin Oore, 2016). Evaluating the strength of a climate may be particularly important for understanding the depth and breadth of change interventions needed to transform an underlying culture.

Future studies with larger data sets and additional measures of safety outcomes are needed. Researchers also might include other variables that have been shown to relate to a safety climate, such as job satisfaction, trust, teamwork, and organizational commitment (Valentine, Nembhard, & Edmondson, 2015; Zohar, 2010).

CONCLUSION

Care quality and legal and financial imperatives place increasing pressure on healthcare leaders to assess periodically the organization's PSC. We developed a simple U.S.-based diagnostic instrument to accomplish that in various healthcare settings. The instrument can be used as a gauge of an organization's overall PSC in a stable practice environment or as an assessment tool during organizational change. Although we noted the instrument's limitations, the strength of our PSC survey's psychometric properties is reinforced by

the preliminary signs of validation from CMS and The Leapfrog Group reports. We encourage healthcare leaders to use a variety of PSC assessment measures in light of their association with, and the critical importance of, patient safety outcomes.

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