

Safety Culture in Healthcare: A review of concepts, dimensions, measures and progress

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Table of Contents

CHAPTER 2: SAFETY CULTURE IN HEALTHCARE: A REVIEW OF CONCEPTS, DIMENSIONS, MEASURES AND PROGRESS	2
2.0 Abstract.....	2
2.1 Introduction.....	3
2.2 Methods.....	3
2.2.1 Integrated Literature Review.....	3
2.2.2 Literature Search.....	4
2.2.3 Inclusion and Exclusion Criteria.....	4
2.2.4 Selection Process.....	4
2.3 Results.....	6
2.3.1 Theoretical Underpinnings.....	6
2.3.2 Defining Safety Culture.....	6
2.3.3 Dimensions of Safety Culture.....	7
2.3.4 Measuring Safety Culture.....	9
2.3.5 Progress in Improving Safety Culture.....	11
2.4 Discussion.....	15
2.5 References.....	19

CHAPTER 2: SAFETY CULTURE IN HEALTHCARE: A REVIEW OF CONCEPTS, DIMENSIONS, MEASURES AND PROGRESS

2.0 Abstract

A growing body of peer-reviewed studies demonstrates the importance of safety culture in healthcare safety improvement, but little attention has focused on developing a common set of definitions, dimensions and measures. The purpose of this literature review was to identify and summarize previous studies which define, assess, and explore improvement in safety culture as the concept applies to healthcare. Specific objectives include: summarizing definitions of safety culture and safety climate; identifying theories, dimensions and measures of safety culture in healthcare; and reviewing progress in improving safety culture. One hundred and thirty-seven sources meeting the study inclusion requirements were included in this review. Results suggest that there is disagreement among researchers as to how safety culture should be defined, as well as whether or not safety culture is intrinsically diverse from the concept of safety climate. This variance extends into the dimensions and measurement of safety culture, and interventions to influence culture change in organizations. Most studies utilize quantitative surveys to measure safety culture, and propose improvements in safety by implementing multifaceted interventions targeting several dimensions. Moving forward, a common set of definitions and dimensions will enable researchers to better share information and strategies to improve safety culture in healthcare, building momentum in this rapidly expanding field. Advancing the measurement of safety culture to include both quantitative and qualitative methods should be further explored.

Keywords: safety culture; safety climate; patient safety; healthcare; literature review

2.1 Introduction

The term 'safety culture' first appeared after the Chernobyl nuclear power disaster in 1988. Since then, the concept has been embraced by several industries to improve safety, especially in high reliability organizations [HROs] otherwise known as extremely safe, high-risk organizations (e.g., aviation). More recently, the focus on building a culture of safety has moved to the healthcare domain. Since the Institute of Medicine's landmark *To Err is Human* report (1999), a growing body of peer-reviewed studies has demonstrated the importance of safety culture in healthcare safety improvement; however, little attention has focused on developing a common set of definitions, dimensions and measures of safety culture in healthcare. The purpose of this literature review was to identify and summarize previous studies which define, explore and assess safety culture as the concept applies to healthcare (see Table 2-1 for sources of the review, located at the end of this chapter). Specific objectives include: summarizing definitions of safety culture and safety climate; identifying theoretical underpinnings, dimensions and measures of safety culture in healthcare; and reviewing progress in improving culture via interventions.

2.2 Methods

2.2.1 *Integrated Literature Review*

This literature review followed Ganong's (1987) guidelines for integrative research reviews. An integrated literature review gathers and systematically categorizes information from primary research. Past research was summarized by drawing conclusions from multiple studies to present the state of knowledge about the topic and highlight areas for future research (Cooper, 1989).

2.2.2 Literature Search

Studies were identified by searching Scopus, Web of Science, Cumulative Index to Nursing and Allied Health Literature [CINAHL], PubMed, and PsycINFO electronic databases. Search terms included (safety culture* or safety climate* or culture of safety*) and (healthcare* or hosp* or long term care* or nursing home* or community*) and (patient safety* or public safety*). The searches were limited to English-language studies published between 1980 and 2009.

2.2.3 Inclusion and Exclusion Criteria

To be eligible for inclusion in the review, the studies had to (a) focus on healthcare; and (b) describe one or more of the following: definition of safety culture or climate as a concept, provide dimensions of safety culture, measures, and/or intervention(s) and progress in the study of safety culture in healthcare. Publications were excluded if they were (a) published before 1980; (b) written in languages other than English; (d) were not peer-reviewed; or (e) lacked information related to the specific inclusion criteria as previously outlined.

2.2.4 Selection Process

The final search yielded 1341 articles. After 17 duplicates were excluded, a total of 1324 titles were reviewed. Of these, a total of 1124 unique abstracts were rejected as they did not meet inclusion criteria. This resulted in 200 retrieved full-text papers. Articles that did not provide sufficient information on safety culture as a concept in healthcare were then excluded. A total of 137 studies met all eligibility criteria. Two reports and two books were also included, as secondary sources from the studies reviewed. Figure 2-1 shows a flow diagram of the search strategy and selection process.

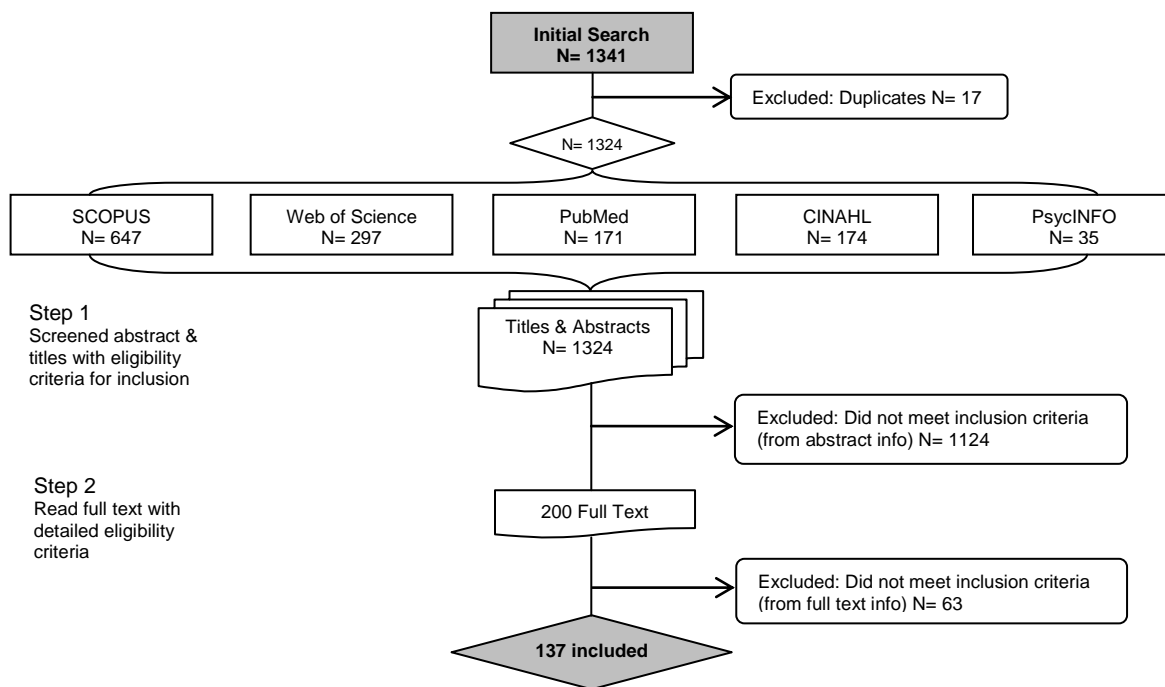


Figure 2-1. Flow diagram of search strategy and selection process

Finally, the Safety Culture in Healthcare Data Collection Tool (Table 2-2) was designed to create a summary table of reviewed articles for use in this project. Following integrated literature review principles, a descriptive approach to synthesis of findings was used; common themes and content were identified and analyzed.

Table 2-2
Components of Safety Culture in Healthcare Data Collection Tool

Field
1. Author(s)
2. Year of study
3. Country of Origin
4. Setting
5. Purpose of study
6. Type of research design
7. Theoretical underpinnings
8. Sample
9. Instrument/tools used
10. Safety culture or climate definition
11. Safety culture or climate dimensions identified
12. Study findings
13. Factors identified as affecting safety culture

2.3 Results

Of the 137 studies reviewed, most were from the United States (n=89) followed by Canada (n=15), the United Kingdom (n=8), and several European countries (n=10). One randomized control trial was also identified from the United States (Thomas, Sexton, Neilands, Frankel & Helmreich, 2005).

2.3.1 Theoretical Underpinnings

In this review, fifty-eight articles used theory to guide their studies or proposed theories to move research in safety culture forward. Within these studies, thirty-two different theories emerged (Table 2-1 contains a list of theories by article), and some studies employed more than one theory to underpin their research. The most frequently adopted theories were as follows: High Reliability Organization [HRO] Theory (n=16), varying forms of Westrum's Culture Typology Model (n=7), Donabedian's Process-Structure-Outcome Model (n=5), Organizational Theory (n=4) and Systems Theory (n=4).

2.3.2 Defining Safety Culture

Common terminology included safety culture, culture of safety, or safety climate. Results indicate considerable variation in the use of terms and definitions. There is an ongoing debate about whether safety culture is inherently different from the concept of safety climate. To complicate the situation, the two terms are often defined to be essentially the same concept and are used interchangeably within publications.

Most researchers prefer the term safety culture (n=42), others adopted the term safety climate (n=8), and some studies took a more holistic approach defining both terms (n=9) (Table 2-1). An overwhelming majority of studies did not define safety culture or safety climate at all (n=82). The most commonly used definition of safety culture was as follows (n=17):

The product of individual and group values, attitudes, competencies and patterns of behaviour that determine the commitment to, and the style and proficiency of, an organization's health and safety programmes. Organizations with a positive safety culture are characterized by communications founded on mutual trust, by shared perceptions of the importance of safety, and by confidence in the efficacy of preventive measure. (Health and Safety Commission, 1993, p.23)

Meanwhile, safety climate was commonly defined as “surface features of the safety culture from attitudes and perceptions of individuals at a given point in time” and “the measurable components of safety culture.” (Gaba, Singer, Sinaiko, Bowen & Ciavarelli, 2003, p.173; Colla, Bracken, Kinney & Weeks, 2005, p.364).

2.3.3 Dimensions of Safety Culture

Safety culture is multidimensional, wherein, several different dimensions comprise the concept (e.g., safety leadership, teamwork, adverse event reporting, etc.). In most cases, researchers and organizations adopt a model of safety culture that features several dimensions. Many researchers introduced dimensions of safety culture to explain the concept, or through the use or development of safety culture questionnaires. However, much like the disagreement in terminology and definition of safety culture, this variance extends into which dimensions comprise a positive safety culture. Most dimensions arose from literature reviews and subsequent factor analysis of quantitative safety culture questionnaires and became a way to conceptualize safety culture. Table 2-3 offers some of the most commonly cited dimensions of safety culture in healthcare. The majority of these combinations share the following dimensions:

- Leadership commitment to safety,
- Open communication founded on trust,
- Organizational learning,
- A non-punitive approach to event reporting and analysis,
- Teamwork
- Shared belief in the importance of safety.

Table 2-3
Commonly Cited Dimensions of Safety Culture and Corresponding Surveys

Source Study		Dimensions of Safety Culture	Survey
Original Authors	# Times Cited in Current Review		
Sorra & Nieva, 2004	18	Management support for safety Supervisor expectations and actions promoting safety Compliance with procedures Teamwork within units Teamwork across units Handoffs and transitions Staffing Openness of communication Non-punitive response to error Error feedback and communication Positive reporting norms Organizational learning	Agency for Healthcare Research and Quality [AHRQ] Hospital Survey on Patient Safety Culture [HSOPSC]
Sexton, Helmreich, Neilands, Rowan, Vella, Boyden et al., 2006	16	Teamwork climate Stress climate Job satisfaction Stress recognition Perceptions of management Working conditions	Safety Attitudes Questionnaire [SAQ]
Singer, Meterko, Baker, Gaba, Falwell & Rosen, 2007	12	Organization leadership for safety Unit leadership for safety Perceived state of safety Shame and repercussions of reporting Safety learning behaviours	Patient Safety Culture in Healthcare Organizations Survey [PSCHO]
Reason, 1998	9	Informed Wary Just Flexible Learning	Dimensions did not originate from a survey
Weick & Sutcliffe, 2001	7	Preoccupation with failure Reluctance to accept simplifications Sensitivity to operations Resilience to error Deference to expertise	Dimensions did not originate from a survey
Pronovost, Weast, Holzmueller, Rosenstein, Kidwell, Haller et al., 2003	8	Commitment of leadership to discussing and learning from errors Documenting and improving patient safety Encouraging and practicing teamwork Spotting potential hazards Using systems for reporting and analyzing events Celebrating workers for improving safety	Safety Climate Scale [SCS]

2.3.4 Measuring Safety Culture

Safety culture in healthcare settings is typically assessed through quantitative questionnaires based upon any number and combination of the dimensions mentioned in Table 2-2. This review identified 12 different tools, as shown in detail in Table 2-1, and four of the most frequently cited are listed in Table 2-2. While one study suggested measuring safety culture to aid in diagnosing the underlying culture of an organization (Flin, Burns, Mearns, Yule & Robertson, 2006), other authors warned against aggregating survey data, since culture often varied between units of a single hospital, never mind across hospitals or an entire healthcare system (Pronovost & Sexton, 2005; McCarthy & Blumenthal, 2006). Some studies suggested focusing on the unit-level for the study and assessment of safety culture because culture is a local phenomenon (Pronovost & Sexton, 2005; McCarthy & Blumenthal, 2006).

Among the articles reviewed, fourteen utilized qualitative methods to collect data on safety culture. Of these, seven used semi-structured interviews; two employed focus groups, and two used observations as the method of data collection. All articles employing qualitative methods were summarized in Table 2-1.

A few studies adapted Westrum's (2004) industry-focused typology of organizational cultures into varying models of cultural maturity for healthcare settings. Cultural maturity has been conceptualized as the status of a particular organization's safety culture, positioned along a continuum from a low maturity level of safety to a high level of safety, based on varying dimensions of safety culture. According to Westrum (2004), five phases of safety culture maturity were characterized to be:

Pathological: Who cares about safety as long as we are not caught?

Reactive: Safety is important - we do a lot every time we have an accident.

Calculative: We have systems in place to manage all hazards.

Proactive: We try to anticipate safety problems before they arise.

Generative: Safety is how we do business around here.

Three studies made use of Westrum's model by adapting it to fit the healthcare context by developing new tools, such as the Manchester Patient Safety Framework [MaPSaF] and the Patient Safety Culture Improvement Tool [PSCIT] (Ashcroft, Morecroft, Parker & Noyce, 2005; Kirk, Parker, Claridge, Esmail & Marshall, 2007; Fleming & Wentzell, 2008). These tools can be used in a collaborative manner. For example, a team of individuals from an organization can come together and build consensus on where their organization lies in the phases of culture maturity. These tools were developed to assist healthcare organizations in not only diagnosing their cultures, but also to provide a framework for how to improve their cultures.

While surveys can provide an understanding of staff attitudes and beliefs, it was recommended by several authors to supplement this quantitative data with richer qualitative data through interviews, focus groups and/or observations to gain a better sense of the underlying culture (Flin et al., 2006; Nieva & Sorra, 2003; Singer, Lin, Falwell, Gaba & Baker, 2008). Employing ethnographic methods of observation and interviews were also suggested to examine the validity of surveys (Flin et al., 2006). In addition, narratives were proposed as a means to study safety culture, since they are a strong method to elicit the voices of those working within organizations (Clarke, Lerner & Marella, 2007). To gain a deep understanding of culture requires intensive long-term study, using aforementioned interview and observational techniques longitudinally, an approach which was not carried out in the reviewed studies (Singer et al., 2008).

2.3.5 Progress in Improving Safety Culture

Despite the rise in healthcare safety culture assessment, description alone cannot improve the safety culture of an organization. Instead, improving safety culture was most frequently accomplished by implementing a number of interventions, often targeting one or more dimensions of safety culture at a time. Twenty-one studies reported or proposed the improvement of safety culture by implementing multifaceted interventions (Table 2-1). One study suggested that the first step to improving safety culture was to assess the current status, normally accomplished via surveys (Huang, Clermont, Sexton, Karlo, Miller, Weissfeld et al., 2007). The following stepwise solution to improving safety was proposed by one group of researchers: 1) Assess culture of safety; 2) Provide safety science education; 3) Identify safety concerns; 4) Establish senior leadership partnerships with units; 5) Learn from one safety defect per month; and 6) Reassess culture (Pronovost, Weast, Rosenstein, Sexton, Holzmueller, Paine et al., 2005).

Some studies reported improvement in safety via pre- and post-safety culture survey evaluations (Pronovost, Berenholtz, Goeschel, Thom, Watson, Holzmueller et al., 2008; Pronovost et al., 2005; Hindle, Haraga, Radu & Yazbeck, 2008; Thomas et al., 2005; Verschoor, Taylor, Northway, Hudson, Van Stolk, Shearer et al., 2007; Tiessen, 2008), however most organizations showed little to no change in culture. Given that the majority of studies were only one or two years in length, these findings should not discourage researchers and healthcare practitioners as culture change takes time. A couple of articles brought this issue to light, suggesting that changing culture could take anywhere from 3 to 5 years (Ginsburg, Norton, Casebeer & Lewis, 2005; Connor, Duncombe, Barclay, Bartel, Borden, Gross et al., 2007).

Similar to any other aspect of safety culture discussed so far, several interventions to improve safety exist, and some are more prevalent than others. Team training, patient

safety team creation, leadership “walkarounds” and patient safety education programs were the most frequently cited interventions, however, other less frequently implemented interventions such as safety audits, event reporting and analysis systems, and the dissemination of patient safety-related information to staff and patients were also reported. For the purpose of this article, four most frequently cited interventions will be discussed in detail; however frequency does not determine effectiveness, a systematic review on effectiveness of interventions is yet to be published. All articles implementing or proposing interventions were itemized in Table 2-1.

2.3.5.1 Team Training

Twenty publications cited the use of team training in various formats to improve teamwork, communication and safety culture. Most studies reported using Crew Resource Management [CRM] training or some variation of it. With origins in the aviation industry, CRM has since been adapted for use in healthcare (Oriol, 2006). An intervention of this nature uses techniques such as team training, simulation, interactive group briefings and debriefings and performance feedback, focusing on how human factors interact with high risk situations. The program trains teams in briefing, inquiry, assertion, workload management, vigilance and conflict resolution (Oriol, 2006).

2.3.5.2 Creation of a Patient Safety Team

Similarly, seventeen of the reviewed articles focused on the creation of a team responsible for improving patient safety culture. Teams took several different forms, and some emerged from existing teams or committees within an organization. Teams were usually comprised of 4-10 members (Taylor, Parmelee, Brown, Strothers, Capezuti & Ouslander, 2007; Cook, Hoas, Guttmanova & Joyner, 2004). Most often team membership included the following: representatives from senior leadership team, directors or managers of

patient safety, quality improvement, risk management, patient care, and/or performance improvement, a patient safety officer, nurse leaders, physicians, surgeons, pharmacists and nurses. These teams were a forum for ongoing problem-solving, providing training on safety concepts, monitoring the culture of the organization, sharing status reports, trending data, implementing safety initiatives and tracking changes (Taylor et al., 2007; Yates, Bernd, Sayles, Stockmeier, Burke & Merti, 2005; Cook et al., 2004; Gandhi, Graydon-Baker, Barnes, Neppl, Stapinski, Silverman et al., 2003).

Leadership was often responsible for ensuring that involved nurses and doctors could spend 20 per cent of their time on the team-related functions, as well as for making resources available for the team's initiatives (Pronovost, Berenholtz, Goeschel, Needham, Sexton, Thompson et al., 2006; Yates et al., 2005). Another article illustrated the benefits of recruiting a physician to act as team leader, since it promoted buy-in, engagement in educational opportunities, and involvement in patient safety interventions by other doctors in the organization (Gandhi et al., 2003).

2.3.5.3 Leadership Walkarounds

Leadership walkarounds were implemented by fifteen of the studies reviewed. These rounds are held weekly in different areas of the organization, where a group of senior executives and often other members of the management team (i.e., risk management, patient safety, quality improvement, etc.) visit units. Available employees on the unit were asked to join in an hour-long discussion about safety issues and to identify active safety issues. Comments and events identified in rounds were documented, often entered into a database, classified based on contributing factors and prioritized for action by the leadership group (Frankel, Graydon-Baker, Neppl, Simmonds, Gustafson & Gandhi, 2003).

Leadership walkarounds have proven effective in bridging the gap between leadership and frontline staff, promoting culture change, identifying opportunities to

improve safety, and educating staff on patient safety issues (Campbell & Thompson, 2007; Frankel et al., 2003; Frankel, Grillo, Pittman, Thomas, Horowitz, Page et al., 2008; Thomas et al., 2005).

2.3.5.4 Patient Safety Education

Patient safety education programs for staff are another commonly implemented intervention (n=10). While some studies reported improved staff safety behaviours and safety culture after the training in patient safety, others suggested best methods to educate staff (Grant, Donaldson & Larsen, 2006; Verschoor et al., 2007; Ginsburg et al., 2005). Training topics included patient safety fundamentals, medical errors and near misses, root cause analysis [RCA], systems theory, event reporting and analysis, importance of teamwork and communication. The most frequent approach to educational programs were teaching modules using any combination of lectures, case studies, simulation and observation (Thompson, Cowan, Holzmueller, Wu, Bass & Pronovost, 2008). The literature suggested that problem-based, interactive, experiential learning sessions were best, and cautioned against less than 30 attendees, since below this threshold the value of interactive dialogue was reduced (Thompson et al., 2008; Dunn, Mills, Neily, Crittenden, Carmack & Bagian, 2007). The importance of continuous training was stressed since practice change and safety improvement were not commonplace after a single exposure to training (Milne & Lalonde, 2007). Other researchers recommended patient safety curricula that promote learning from adverse events, especially for future care providers, adding that ideal timing was during schooling (Vohra, Johnson, Daugherty, Wen & Barach, 2007; Thompson et al., 2008).

2.4 Discussion

Despite the increase in peer-reviewed studies on safety culture in healthcare in the past 29 years, many studies poorly defined the concept and there was much disagreement on how safety culture should be conceptualized. Similarly, the dimensions of a positive safety culture also varied. The most common concepts have been reported here. Dimensions of a positive safety culture often arose from surveys adopted by organizations. Diverse tools to measure safety culture were identified, most often in the form of quantitative surveys; yet, many studies indicated a need for more qualitative inquiry into safety culture employing methods such as interviews, focus groups and longitudinal observational studies (Clarke et al., 2007; Gershon, Stone, Bakken & Larson, 2004; Ginsburg et al., 2005). A couple of articles suggested the study of safety culture should focus on units rather than entire organizations, as culture is a context-specific, local phenomenon (Pronovost & Sexton, 2005; McCarthy & Blumenthal, 2006).

Generally, improvements in safety culture were accomplished by implementing multifaceted interventions, targeting more than one dimension of safety culture at a time. A mixture of interventions to improve safety were introduced and implemented by the reviewed studies. Although some studies reported improvement in safety, most organizations showed little to no change in culture. This should not discourage further research and intervention efforts, as culture change takes time, realistically three to five years. Many studies indicated that strong leadership commitment to safety improvement was essential to success, while another suggested that the existence of an open, generative culture will ensure better uptake of innovations (Westrum, 2004).

Consolidating key lessons for improving safety culture from the reviewed articles is schematically presented in the following emerging model (Figure 2-2). Defining and conceptualizing safety culture for one's organization is important in setting the stage for

strategic culture change. As culture is a context-specific, local phenomenon, it may be best to focus on the unit-level rather than the entire organization. In this manner, improving each unit's safety culture will contribute to improving the whole organization's safety culture. The first step in building and improving safety culture would be an assessment of the current safety culture via surveys, or better yet, through in-depth observational study. The resulting strengths should be celebrated and weaknesses addressed using a targeted intervention. An ongoing process of measuring, improving and evaluating safety culture should then be undertaken. The emerging model of improvement includes a continuous process of identifying strengths and weaknesses, implementing interventions, and evaluation (Figure 2-2).

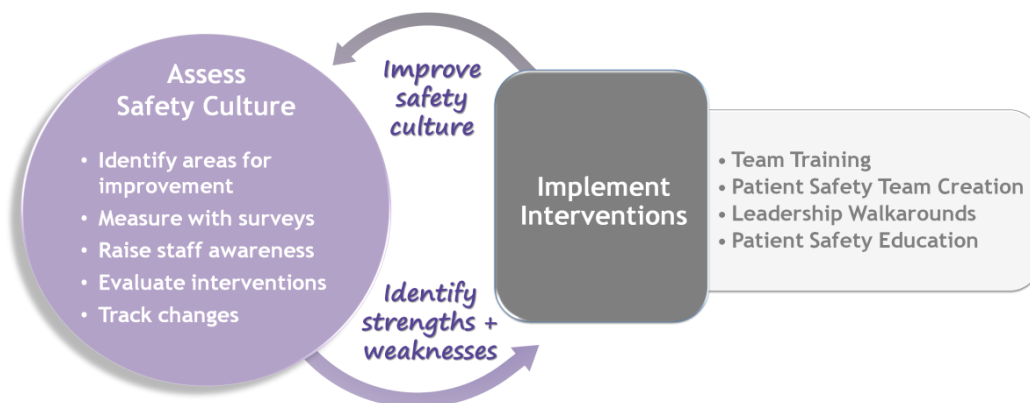


Figure 2-2. Emerging model of healthcare safety culture improvement based on key concepts from reviewed literature

Although the utmost effort was put in place to provide a comprehensive review of currently available evidence about safety culture in healthcare, this review has several limitations. The majority of studies included were from the acute care hospital setting, some were from rehabilitation settings and long-term care, and essentially none were from

community settings including the home care sector. In addition, this review did not assess the methodological quality of studies. Nevertheless, the review provides a starting point with which to come to a common understanding and use of definitions and measures of safety culture.

While the quantity of studies on safety culture in healthcare has risen dramatically in the past decade, the number of studies in this review that overlooked the importance of properly defining concepts and guiding research with theory is surprising. Perhaps some researchers believe the study of safety culture in healthcare is now commonplace and that these concepts no longer need to be defined, however, it is unlikely that safety culture is common sense to most healthcare workers.

While some studies derived models of conceptualizing safety culture from research in other industries, such as nuclear power and aviation, many ways of thinking about culture and its dimensions seemed to come from factor analysis of surveys. Understanding culture warrants more in-depth study, and certainly conceptualizing safety culture should arise from theories based on rich studies of safety cultures. Developing and using theory to guide the collection, analysis and evaluation of evidence is a neglected facet of obtaining the knowledge needed to study safety culture.

While this review provided an overview of several concepts, the concept that really seems to be missing in the study of safety culture in healthcare is culture itself. Not one study in this review was conducted by an anthropologist, nor do any studies adopt ethnography as a methodology. Since anthropologists are considered experts in understanding culture, shouldn't more healthcare agencies be employing or consulting these experts to conduct research on safety culture? Some studies did propose the need for more in-depth, observational, longitudinal research; however, in practice most organizations were adopting surveys to study culture. While surveys are a pragmatic

means of collecting data, questionnaires at best provide a superficial and calculated snapshot of climate, not culture.

Moving forward, a common set of concepts will enable researchers to better share information and strategies to improve safety culture in healthcare, building momentum in this rapidly expanding field. Advancing the measurement of safety culture to include both quantitative and qualitative methods should be further explored, and longitudinal research in culture change is required.

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Table 2-1

Summary Table of Reviewed Studies Citing Definitions of Safety Culture/Climate, Dimensions, Theoretical Underpinnings, Measurements, and Interventions

Reference List #	Author(s)	DEF			Theoretical Underpinnings	Measurement			Intervention(s)
		Culture	Climate	Dimensions Explored		Qualitative	Survey	Tool	
45	Aase et al., 2008			✓		I	✓	AHRQ HSOPSC	Walkarounds
46	Alonso et al., 2006				Framework of TeamSkills				Team Training
47	Amalberti et al., 2005			✓	Normal Accident Theory				
48	Anderson, 2006	✓				I			Walkarounds, Team Creation, Patient Safety Education, Event Reporting and Analysis, Dissemination of Information
49	AORN, 2006	✓		✓			✓	PSCHO	
50	Armstrong & Laschinger, 2006			✓	Theory of Structural Empowerment		✓	SCS	
51	Armstrong et al., 2009		✓	✓	Theory of Structural Empowerment		✓	SCS	
16	Ashcroft et al., 2005	✓		✓	Culture Typology	C		MaPSaF	
52	Barach, 2007								Team Training, Event Reporting and Analysis
53	Battles & Lilford, 2003			✓	Donabedian's Process-Structure-Outcome Model				
54	Beyea, 2002			✓					
55	Blake et al., 2006			✓		I	✓	AHRQ HSOPSC	
56	Bonner et al., 2007				Donabedian's Process-Structure-Outcome Model				Walkarounds, Dissemination of Information

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Reference List #	Author(s)	DEF			Theoretical Underpinnings	Measurement			Intervention(s)
		Culture	Climate	Dimensions Explored		Qualitative	Survey	Tool	
57	Bonner et al., 2009	✓		✓	Donabedian's Process-Structure-Outcome Model		✓	AHRQ HSOPSC	
58	Burt, 2008								Team Training
59	Calabro & Baraniuk, 2003		✓	✓	Organizational Theory		✓	Survey of Factors Related to Inpatient Violence	
38	Campbell & Thompson, 2007			✓					Walkarounds
60	Carroll & Edmondson, 2002			✓					
61	Castle & Sonon, 2006	✓		✓			✓	AHRQ HSOPSC	
62	Castle et al., 2007	✓		✓			✓	AHRQ HSOPSC	
63	Castle, 2006	✓		✓	Berend's Safety Culture Model		✓	AHRQ HSOPSC	
64	Catchpole et al., 2007								Team Training
65	Christian et al., 2006					O			
21	Clarke et al., 2007	✓		✓					
66	Cohen et al., 2003			✓					Walkarounds, Team Creation
67	Cohen et al., 2004			✓					Team Creation, Event Reporting and Analysis
5	Colla et al., 2005		✓	✓					
29	Connor et al., 2007			✓					
31	Cook et al., 2004						✓	Close Call Pilot Culture Assessment	Team Creation, Event Reporting and Analysis

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Reference List #	Author(s)	DEF			Theoretical Underpinnings	Measurement			Intervention(s)
		Culture	Climate	Dimensions Explored		Qualitative	Survey	Tool	
68	Currie & Watterson, 2007			✓					
69	Doucette, 2006			✓	SBAR Framework				Team Training
41	Dunn et al., 2007			✓	Kirkpatrick's Evaluation Framework		✓	SAQ	Team Training, Patient Safety Education
70	Eisenberg, 2000			✓					
71	Elder et al., 2008	✓	✓	✓	Adult Learning Theory	I	✓	SCS, AHRQ HSOPSC	Walkarounds, Patient Safety Education
72	Fancott et al., 2006				SAFE Framework	FG			
73	Feng et al., 2008	✓		✓	Safety Platform Model, Culture Web Model, Model of Organizational Culture				
18	Fleming & Wentzell, 2008	✓		✓	Culture Typology	C		PSCIT	
74	Fleming-Carroll et al., 2006			✓	Task-oriented Partnership Model				Team Creation, Patient Safety Education, Dissemination of Information
75	Flin & Yule, 2004			✓	Transformational/ Transactional Leadership Theory				Team Training
12	Flin et al., 2006	✓	✓	✓	HRO Theory				
76	France et al., 2005								Team Training
77	France et al., 2008								Team Training

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Summary Table of Reviewed Studies Citing Definitions of Safety Culture/Climate, Dimensions, Theoretical Underpinnings, Measurements, and Interventions

Reference List #	Author(s)	DEF			Theoretical Underpinnings	Measurement			Intervention(s)
		Culture	Climate	Dimensions Explored		Qualitative	Survey	Tool	
36	Frankel et al., 2003	✓			Deming's Rapid-Cycle Improvement Theory				Walkarounds, Team Creation
37	Frankel et al., 2008		✓	✓			✓	SAQ	Walkarounds
4	Gaba et al., 2003	✓	✓	✓	HRO Theory		✓	PSCHO	
33	Gandhi et al., 2003						✓		Walkarounds, Team Creation, Patient Safety Education
78	Garnerin et al., 2006	✓			Culture Typology, London Protocol				Safety Audits
44	Gershon et al., 2004			✓					
28	Ginsburg et al., 2005			✓			✓	PSCHO	Patient Safety Education
79	Ginsburg et al., 2009	✓		✓			✓	Modified Stanford Instrument akin to PSCHO	
39	Grant et al., 2006			✓			✓	SAQ	Patient Safety Education
80	Grogan et al., 2004								Team Training
81	Guerlain et al., 2008								Team Training
82	Halbesleben et al., 2008			✓	Conservation of Resources Model		✓	AHRQ HSOPSC	
83	Haller et al., 2008			✓	Kirkpatrick's Evaluation Framework		✓	SAQ	Team Training
84	Handler et al., 2006	✓		✓			✓	AHRQ HSOPSC	
85	Hartmann et al., 2008			✓	HRO Theory		✓	PSCHO	
86	Hellings et al., 2007	✓		✓	Culture Typology		✓	AHRQ HSOPSC	

Table 2-1

Summary Table of Reviewed Studies Citing Definitions of Safety Culture/Climate, Dimensions, Theoretical Underpinnings, Measurements, and Interventions

Reference List #	Author(s)	DEF			Theoretical Underpinnings	Measurement			Intervention(s)
		Culture	Climate	Dimensions Explored		Qualitative	Survey	Tool	
25	Hindle et al., 2008	✓		✓			✓	Questionnaire of Patient Safety at Your Hospital	
87	Hofoss & Delikas, 2008	✓			HRO Theory				Walkarounds, Patient Safety Education, Safety Audits
22	Huang et al., 2007	✓		✓			✓	SAQ	
88	Hudson, 2003	✓		✓	Model of Cultural Maturity				
89	Hughes & Lapane, 2006			✓			✓	AHRQ HSOPSC	
90	Jeffcott & Mackenzie, 2008			✓	HRO Theory		✓	SAQ	
91	Kalisch & Aebersold, 2006	✓		✓	HRO Theory				
92	Keroack et al, 2007					I			
93	Kho et al., 2005						✓	SCS	
17	Kirk et al., 2007	✓		✓	Culture Typology	C		MaPSaF	
94	Lindberg et al., 2008	✓		✓			✓	Safety Culture Priority Index	
95	Marshall & Manus, 2007			✓			✓	AHRQ HSOPSC	Team Training
14	McCarthy & Blumenthal, 2006	✓		✓			✓	SAQ	
96	McConaughey, 2008				Error Theory, Reason's Swiss Cheese Model of Accident Causation				Team Training
97	McKeon et al., 2006			✓	Complexity Theory				Team Training

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Reference List #	Author(s)	DEF			Theoretical Underpinnings	Measurement			Intervention(s)
		Culture	Climate	Dimensions Explored		Qualitative	Survey	Tool	
98	McKeon et al., 2009			✓	Complexity Theory				Team Training
99	Meaney, 2004	✓	✓	✓	Culture Web Model				
100	Mercurio, 2007	✓		✓			✓	AHRQ HSOPSC	
101	Miller, 2003								Team Training
102	Milligan, 2005	✓		✓					
103	Milligan, 2007			✓	Human Factors Theory				Patient Safety Education
104	Mills et al., 2008			✓					
42	Milne & Lalonde, 2007			✓	Error Theory		✓	Culture Change Assessment Tool	Patient Safety Education
105	Modak et al., 2006			✓			✓	SAQ	
106	Mohr & Batalden, 2002			✓	Systems Theory, Normal Accident Theory, Theory of Smallest Replicable Unit	I			
107	Mohr et al., 2003	✓		✓					
108	Moody et al., 2006	✓		✓	Kirton Adaptation-Innovation Theory of Cognitive Style		✓	AHRQ HSOPSC	
109	Mustard, 2002	✓							
19	Nieva & Sorra, 2003	✓		✓	Systems Theory				
110	O'Connor et al., 2006				Promoting Action on Research Implementation in Health Services (PARIHS) Framework	FG			Patient Safety Education, Safety Audits, Dissemination of Information
30	Oriol, 2006								Team Training

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Reference List #	Author(s)	DEF			Theoretical Underpinnings	Measurement			Intervention(s)
		Culture	Climate	Dimensions Explored		Qualitative	Survey	Tool	
111	Perry, 2002			✓	Organizational Theory, HRO Theory				
112	Powell, 2006			✓	HRO Theory				Team Training
11	Pronovost et al., 2003	✓		✓			✓	SCS	
13	Pronovost & Sexton, 2005			✓			✓	SAQ	CUSP is a combination of Walkarounds, Team Creation, Dissemination of Information, Tailored Safety Interventions
23	Pronovost et al., 2005			✓			✓	SAQ	CUSP (Walkarounds, Team Creation, Dissemination of Information, Tailored Safety Interventions)
35	Pronovost et al., 2006			✓	HRO Theory, Donabedian's Process-Structure-Outcome Model, Change Theory		✓	SAQ	CUSP (Walkarounds, Team Creation, Dissemination of Information, Tailored Safety Interventions)
24	Pronovost et al., 2008			✓	Change Theory		✓	SAQ	CUSP (Team Creation)
113	Pronovost et al., 2008	✓		✓					Event Reporting and Analysis
114	Rall & Dieckmann, 2005	✓		✓	HRO Theory, 4-P Model				Team Training
115	Roberts & Perryman, 2007	✓							
116	Rose et al., 2006		✓	✓			✓	SAQ	

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Reference List #	Author(s)	DEF			Theoretical Underpinnings	Measurement			Intervention(s)
		Culture	Climate	Dimensions Explored		Qualitative	Survey	Tool	
117	Rosen et al., 2008			✓			✓	PSCHO	
118	Ruchlin et al., 2004			✓	Organizational Theory, HRO Theory, Normal Accident Theory				
119	Schutz et al., 2006	✓		✓			✓	AHRQ HSOPSC	
120	Scott-Cawiezell et al., 2006	✓		✓					
7	Sexton et al., 2006	✓	✓	✓	Donabedian's Process-Structure-Outcome Model		✓	SAQ	
121	Sexton et al., 2007			✓			✓	SAQ; Culture Check-Up Tool	
122	Shostek, 2007	✓		✓					
123	Singer et al., 2003			✓	HRO Theory		✓	PSCHO	
8	Singer et al., 2007			✓	HRO Theory		✓	PSCHO	
124	Singer et al., 2008			✓	HRO Theory		✓	PSCHO	
20	Singer et al., 2008b	✓	✓	✓	HRO Theory		✓	PSCHO	
125	Singer et al., 2009	✓	✓	✓	HRO Theory		✓	PSCHO	
126	Singh et al., 2005	✓			Systems Theory				
127	Snijders et al., 2009	✓	✓	✓			✓	AHRQ HSOPSC	Team Creation, Event Reporting and Analysis
6	Sorra et al., 2008	✓		✓				AHRQ HSOPSC	Event Reporting and Analysis

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Summary Table of Reviewed Studies Citing Definitions of Safety Culture/Climate, Dimensions, Theoretical Underpinnings, Measurements, and Interventions

Reference List #	Author(s)	DEF			Theoretical Underpinnings	Measurement			Intervention(s)
		Culture	Climate	Dimensions Explored		Qualitative	Survey	Tool	
128	Tardif et al., 2008	✓		✓			✓	AHRQ HSOPSC	Walkarounds, Team Creation, Patient Safety Education, Dissemination of Information
32	Taylor et al., 2007			✓					Team Creation, Patient Safety Education
2	Thomas et al., 2005	✓	✓	✓			✓	SCS	Walkarounds, Team Creation
129	Thomas et al., 2003			✓					Team Training
40	Thompson et al., 2008			✓	Systems Theory, Adult Learning Theory		✓	SAQ	Patient Safety Education
26	Tiessen, 2008			✓			✓	Modified Stanford Instrument akin to PSCHO	Walkarounds, Team Creation
130	Turnberg & Daniell, 2008		✓	✓			✓	SCS	
27	Verschoor et al., 2007	✓		✓			✓	SCS	CUSP (Walkarounds, Patient Safety Education, Event Reporting and Analysis, Safety Audits)
131	Vogus & Sutcliffe, 2007a	✓		✓			✓	Safety Organizing Scale	
132	Vogus & Sutcliffe, 2007b			✓			✓	Safety Organizing Scale	

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Reference List #	Author(s)	DEF			Theoretical Underpinnings	Measurement			Intervention(s)
		Culture	Climate	Dimensions Explored		Qualitative	Survey	Tool	
43	Vohra et al., 2007	✓		✓			✓	Sentinel Events at the Academic Hospitals: Evaluation of Housestaff and Medical Student Attitudes toward Adverse Medical Events Survey	Patient Safety Education
133	Weingart et al., 2004			✓			✓	Unnamed survey	
15	Westrum, 2004			✓	Culture Typology				
134	Wholey et al., 2004	✓		✓	Organizational Theory	I			
135	Willeumier, 2004			✓					Event Reporting and Analysis
136	Wilson et al., 2005			✓					Team Training
137	Wisniewski et al., 2007		✓	✓			✓	SAQ	
138	Yates et al., 2004			✓					Walkarounds, Team Creation
34	Yates et al., 2005			✓					Team Creation
139	Youngberg., 2008	✓		✓					Patient Safety Education, Event Reporting and Analysis
140	Zimmerman et al., 2008	✓		✓					Walkarounds
141	Zohar et al., 2007		✓	✓	Organization Climate Theory	O	✓	Nursing Climate Scale	

Note. DEF means definition provided for either safety culture, safety climate or both.

^aQualitative method(s) used by reviewed studies are indicated by: I = interview, FG = focus group, O = observation, and C = collaborative tool.

^bLegend of tool abbreviations: AHRQ HSOPSC = Agency for Healthcare Research and Quality Hospital Survey on Patient Safety Culture, MaPSaF = Manchester Patient Safety Framework, PSCHO = Patient Safety Culture in Healthcare Organizations Survey; SAQ = Safety Attitudes Questionnaire, and SCS = Safety Climate Scale.

^cInterventions such as Event Reporting and Analysis, Dissemination of Information and Safety Audits were not as frequent as other interventions discussed in depth in the results of this review. Abbreviation CUSP = Comprehensive Unit-based Safety Program.