QUALITY IMPROVEMENT ARTICLE

Changing safety culture

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Abstract

Safety culture, an aspect of organizational culture, that reflects work place norms toward safety, is foundational to high-quality care. Improvements in safety culture are associated with improved operational and clinical outcomes. In the neonatal intensive care unit (NICU), where fragile infants receive complex, coordinated care over prolonged time periods, it is critically important that unit norms reflect the high priority placed on safety. Changing the safety culture of the NICU involves a systematic process of measurement, identifying strengths and weaknesses, deploying targeted interventions, and learning from the results, to set the stage for an iterative process of improvement. Successful change efforts require: effective partnerships with key stakeholders including management, clinicians, staff, and families; using data to make the case for improvement; and leadership actions that motivate change, channel resources, and support active problem- solving. Sustainable change requires buy-in from NICU staff and management, resources, and long-term institutional commitment.

Introduction

Developing a culture of safety is critical to improve the quality of health care delivery [1]. Generally referred to as "the way we do things around here," safety culture is defined as the product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine organizational health and safety management [2, 3]. Safety culture reflects the relative priority health care organizations place on safety relative to other competing values such as efficiency or costs [4, 5]. In other words, it is a measure of workplace norms. By providing cues about what is acceptable, safety culture shapes healthcare worker motivation to engage in safe behaviors [6–9]. Safety climate, a related construct, evaluates the shared perceptions within a work setting of existing safety policies, procedures, and practices [10, 11]. Climate provides a snapshot of clinician and staff perceptions about the observable, surface-level aspects of culture during a particular point in time [12, 13].

Using safety culture as the foundation for achieving patient safety took hold with the National Academy of Medicine's landmark report, To Err is Human: Building a Safer Health System [1]. Drawing upon principles from other high-risk industries, the report recognized the systemic and organizational underpinnings of errors in medicine [14]. A system-focused approach traces the causes of errors across the levels of provider, team, unit, and organization [5, 15]. Safety culture reinforces the systemic approach by probing the assumptions, values, attitudes, and patterns that individuals hold toward safety. The clinical relevance of safety culture is well-established, shown to be related to clinician's behaviors such as handwashing and error reporting [16–18], and improved outcomes such as reduction in adverse events [19], fewer readmissions [20], and reduced mortality [19, 21–24]. In the neonatal intensive care unit (NICU), where caring for fragile, vulnerable infants requires coordinated actions across multiple specialties and subspecialties, developing a culture of safety provides a foundation for high quality care by focusing attention on the underlying causes for errors and helping prevent errors [25–27].

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In this article, we suggest ways to improve safety culture in the NICU, as part of the series of articles in the *Journal of Perinatology* on fundamental quality improvement (QI) methods and tools. Previous articles in the series have addressed: assembling a team for a successful QI project [28]; identifying a QI project [29]; basic [30], and advanced tools for QI [31]; using data and measures to drive change [32] and the financial and economic measures for creating the business case for QI [33].

Measuring safety culture

Measurement is the first step toward changing the safety culture of the NICU [34]. Measurement serves a diagnostic function, helping identify areas of improvement [35]. In addition, measurement establishes a common vocabulary that raises awareness, brings the NICU together, and sets the stage for rallying the unit toward improvement [27]. Baseline measurement also serves as a starting point for evaluating the effectiveness of interventions to improve workplace norms and for tracking changes over time [36]. Finally, measurement can fulfill regulatory (Joint Commission) or other requirements (Magnet status) and facilitate internal and external benchmarking [25, 37–39].

Key steps in safety culture assessment [34] include: (1) Involving key stakeholders including senior management, clinicians, staff, and families; (2) Selecting a culture assessment tool; (3) Data collection, synthesizing and interpreting results; and (4) Action planning to implement changes. Involving key stakeholders at the planning stage ensures support both for the measurement effort and for mobilizing support and resources to act on the results. In the NICU setting, where family engagement and involvement in care, is key to long-term outcomes, families are important observers of norms and essential stakeholders to consult. Families have a direct experience of the culture of the NICU and their experience with care can be leveraged to identify critical domains of safety culture for measurement. After key stakeholders are consulted, an appropriate instrument must be selected to reflect the needs of the NICU. Interest in measuring safety culture has led to the development of multiple survey instruments which vary in the domains surveyed, intended respondents (managers only, all staff types and levels) and the settings for which they are intended [9, 25, 37, 39–42]. Selected commonly used survey instruments are summarized in Table 1. Information on additional instruments is also available in multiple reviews [43–45].

Domains measured in safety culture assessments include: perceptions of safety; organizational environment (management and organizational support for safety, reporting systems and nonpunitive responses to error); job environment (work setting norms, personal burnout); team performance (team work, communication); and learning [45, 46]. These domains are derived from a long history of safety culture assessment in high-risk industries such as the nuclear power industry and the commercial aviation [15, 43]. More recently, safety culture instruments have included domains such as burnout, reflecting the widely recognized phenomenon of healthcare worker emotional exhaustion and its attendant impact on safety, an issue that

Table 1 Safety culture survey instruments.

Instrument	Domains measured	Description
Safety Attitudes Questionnaire (SAQ) [117]	Safety climate; Teamwork; Stress recognition; Perceptions of management; Working conditions; and Job satisfaction	Refinement of a similar tool widely used in the aviation industry, SAQ comprises 60 survey items, designed in the form of five-point Likert scales. Completed by individuals, scores are then aggregated to give an indication of the overall strength of the organization's extant safety culture
Safety, Communication, Operational Reliability and Engagement (SCORE) [78]	Safety climate; Teamwork climate; Improvement readiness, Local leadership, Personal burnout, and Burnout climate	Refinement of the SAQ that adds additional work setting norms such as burnout, resilience, work-life balance based on the Job Demands-Resources model. The full version of SCORE has 12 domains, with 73 items with subscales ranging in length from 3 to 8 items.
Agency for Healthcare Research and Quality (AHRQ), Hospital Survey on Patient Safety Culture (Hospital SOPS) [118]	Communication openness; Feedback and communication about error; Frequency of events reported; Handoffs and transitions; Management support for patient safety; Nonpunitive response to error; Organizational learning; Overall perceptions of patient safety; Staffing; Supervisor/Manager expectations and actions promoting safety; Team work across and within units	Consists of 44 questions derived from review of existing safety culture surveys.

is particularly relevant to a high-intensity care setting such as the NICU [47–51]. The choice of a specific instrument should be made in consultation with key stakeholders, including staff, to reflect the specific needs and challenges of the individual NICU. Following best practices for collecting data, such as advance notice, use of mobile devices for ease of data collection, and a follow up strategy to maximize response rates, all contribute to successful assessment [38].

Initiating change

Results of the safety culture assessment can be the starting point for initiating improvements. Progression from data to action requires a systematic and structured process: analyzing data; synthesizing and interpreting results; and sharing them with key stakeholders to develop a shared understanding of both the strengths and challenges related to the NICUs safety culture [5, 25, 27]. Debriefing the results with the help of skilled facilitators can help set the stage for action planning, focusing on specific challenges and involving the team at large in problem-solving efforts. Depending on the results of the assessment, potential interventions (Table 2) could focus on one or more targeted interventions, as the starting point toward a sustained commitment to improving the safety culture of the NICU

[36, 52]. Routine culture measurement, followed by wide dissemination of results and action planning for improvement that involves all key stakeholders has been shown to improve safety culture [53, 54].

Interventions to improve safety culture

Safety culture interventions (Table 2) address several facets of the organizational culture of safety. Rooted in principles of leadership, teamwork, and behavior change, strategies to promote a culture of safety may include implementing either a single intervention to address a specific focus area or multi-faceted interventions [22]. An integrated theoretical model of safety culture interventions [4] suggests that interventions work by enabling, enacting, or elaborating a culture of safety [7, 9, 55]. Enabling refers to creating a supporting context for safety, through practices that direct attention to safety and create a safe environment for staff to speak up and act in ways that improve safety [4, 56]. Encouraging families and all providers on team-based rounds to contribute to assessment and plan for patients in a systematic and predictable manner is one example of enabling. Enacting a culture of safety involves highlighting threats to safety and acting to reduce them [4]. Willingness of frontline staff to disclose errors and multidisciplinary rounding that highlights potential threats to safety for each

Table 2 Interventions to improve safety culture.

| Interventions	Description	Purpose
Executive walk rounds	Senior leadership and/or executives demonstrate organizational commitment to patient safety by visiting front-line healthcare providers to discuss and address patient safety threats.	Signal and reinforce organizational commitment to safety.
Multidisciplinary safety rounds	Daily rounds that explicitly include a safety focus, by reviewing potential threats to safety for individual patients and identifying corrective actions.	Translate the NICUs commitment to safety into daily practice
Team training	Collaborative learning methods that build knowledge and attitudes essential for teamwork effectiveness.	Address safety threats related to lack of coordination and effectiveness among teams
Mindful organizing	Organizational processes derived from high reliability industries exemplified by a focus on: preoccupation with failure; reluctance to simplify interpretations; sensitivity to operations; commitment to resilience; and deference to expertise.	Help healthcare teams identify potential threats to safety and address them using effective interpersonal processes derived from high reliability industries
Relational coordination	Interventions that support timely, problem-solving communication by team members across different functions and roles in the NICU	Improve coordination across different functional roles, specialties, and subspecialties to deliver safer care
Comprehensive Unit-Based Safety Program (CUSP)	Unit-focused methodology addressing patient safety and quality of care that combines multiple techniques, including sustained team training, engaged executive commitment, and evidence-based changes to clinical practice [3, 6, 7]	Improve safety through a comprehensive multifactorial intervention that combines evidence-based practices with behavioral interventions targeting leadership, communication, and teamwork.
Operational improvements	Improving process reliability using methods derived from industrial production such as Toyota Production System and Lean Methodology	System-based interventions that seek to improve reliability of care processes by empowering front-line staff
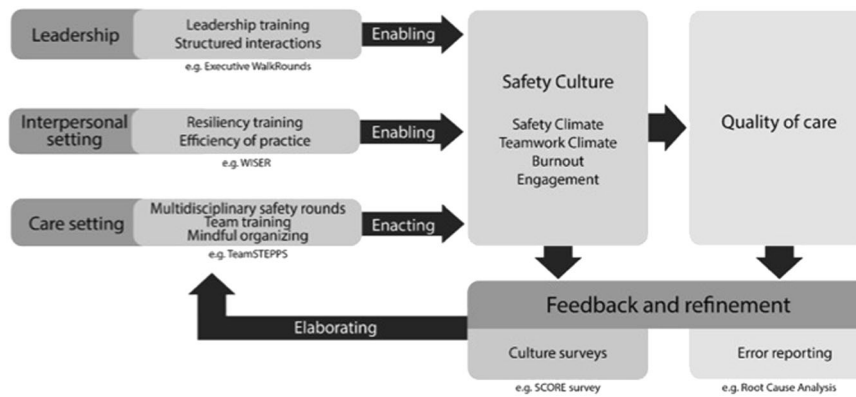
Fig. 1 Conceptual framework relating drivers, outcomes, and feedback mechanisms relevant to safety culture. Drivers such as leadership and specific interventions such as Executive WalkRounds enable and help enact safety culture. Surveys and error reporting provide feedback and help reinforce safety culture. WISER Webbased Implementation of the Science of Enhancing Resilience, Team STEPPs® Team Strategies and Tools to Enhance Performance and Patient Safety, SCORE Safety, Communication, Operational Reliability & Engagement Survey.

patient are examples of enacting safety culture. Elaborating a culture of safety, is to enlarge and refine practices, and institutionalize the continuous process of learning to improve safety as outlined in Fig. 1 [4]. The most common interventions under each of these categories are discussed below.

Enabling safety culture

Organizational practices can enable patient safety by creating a safe space where threats to safety can be identified and resolved. Enabling interventions emphasize leadership actions that direct attention to safety. Specific interventions include structured interactions with front-line staff, such as Executive WalkRounds™ and patient safety rounding.

Promoting effective leadership: Although the majority of academic NICU medical directors have not received formal leadership training, nearly half believe that it would improve their effectiveness [57]. Leaders strongly influence all aspects of culture, including safety culture, suggesting a tremendous opportunity for safety culture improvement through interventions that promote effective leadership [58–65]. Leaders play a critical role in improving the culture of safety by establishing the direction for change, aligning staff, and by motivating and inspiring [66]. In particular, an "authentic leadership" style, in which leaders are relational and humble, has been associated with improved healthcare worker and patient outcomes [67]. In addition, leaders drive change by performing critical managerial functions: securing resources, organizing and planning, removing barriers and by effective problem solving [68, 69]. An organizational commitment to selecting and developing high quality leaders can serve to promote psychological safety and alignment of individual values and organizational priorities—key aspects of a healthy safety culture [67, 70–75]. Strategies include initial selection of leaders based on leadership potential, professional development and directed coaching, and ongoing leadership training throughout all stages of career development [76, 77].

Executive WalkRounds™ (EWR): EWR and Positive Rounding (a focus on things that go well) are interventional strategies that engage organizational leadership directly with front line providers to direct attention to and act on safety concerns [78]. During EWR, executives or senior leaders visit patient care areas to discuss potential threats to safety, as well as support front-line staff in addressing such threats. Senior leaders ask providers to discuss specific events or general processes that could put patients at risk for harm, seek suggestions to improve safety, and reinforce their commitment to improving safety by documenting the discussion, taking appropriate actions, and providing feedback to participants. Data gathered on EWR can be subjected to common cause analysis to understand which issues would be most impactful to deal with at the system level. Positive Rounding, a more recent evolution of EWR, is similarly structured, but deliberately seeks to elicit positive emotion in addition to identifying risks to safety and quality. Positive Rounding uses prompts such as "Please share three things that are going well in this work setting, and one thing that could be better" to shift the focus from deficiencies to topics that elicit pride, gratitude and hope [79, 80]. In the NICU, this approach has been associated with better teamwork climate, safety climate, and lower healthcare worker burnout when coupled with feedback about changes implemented [79]. By seeking and acting on front line providers safety concerns, EWRs and Positive Rounding demonstrate the organization's commitment to safety.

Multidisciplinary safety rounds: Incorporating a safety focus during multidisciplinary daily rounds emphasizes the

priority placed on safety. In addition to setting daily goals of care (getting on the same page across disciplines), rounding can actively incorporate focused attention to evaluating potential threats to patient safety and addressing them with participation from all members of the team. Practicing humble inquiry [81] during rounding by asking questions driven by genuine curiosity, humility, and willingness to learn, can help build relationships of trust by breaking down hierarchical barriers and providing psychological safety. Multidisciplinary rounds also offer a forum to introduce relatively simple safety interventions that signal the NICUs commitment to safety. Standardized communication formats such as SBAR (Situation, Background, Assessment, Recommendation) [82, 83], and other specific strategies to improve team communication can be implemented during rounding to direct attention to safety. In addition, teams can add safety-focused items to a rounding checklist (e.g., any medications that could be stopped or changed to enteral route, any laboratory work or imaging procedure that could be canceled, any central line that can be discontinued).

NICUs can successfully use multidisciplinary safety rounds to surface, highlight, and address patient safety issues during daily rounding. For example, Intermountain Healthcare's Dixie Regional Medical Center NICU in St. George, a level 3, 24-bed (48-patient capacity) unit serving southern Utah has used this approach to improve safety culture, and reduce key neonatal morbidities and costs of care, and are now expanding this intervention in a multi-center trial [84]. Caregivers in the NICU participate in a culture of recognition and respect, a culture in which all have a voice. Multidisciplinary rounds are family-centered, ensuring that the voice of the family is validated [85]. After the family speaks, each member of the team presents data and recommendations for care. Specific interventions that are part of the daily care plan are discussed by the bedside nurse. Therefore, every intervention is surfaced, contributing to the shared pool of understanding on care team rounds. The neonatologist then synthesizes the recommendations into the care plan [86]. Actively involving families during rounding through structured verbal and written communication improves shared understanding, creates an extra safeguard and has been shown to reduce harmful medical errors [87].

Safety culture is negatively correlated with burnout, and enabling safety culture requires attention to preventing and reducing burnout among health care workers. Addressing burnout requires attention to improving the resilience and well-being of individual health care workers [88–90] as well as systemic issues in the practice environment [91]. Interventions designed to elicit positive emotions and connections with colleagues, such as the Web-based Implementation of the Science of Enhancing Resilience (WISER) program and the Colleagues Meeting to Promote and Sustain Satisfaction

program (COMPASS), have been shown to reduce healthcare worker burnout [89, 90]. Other individual interventions commonly focus on stress management, mindfulness-based exercises, or self-care, with the majority reporting 10–15% improvement in burnout scale scores [88]. However, burnout also clusters within NICUs, indicating that it is a group-level construct and requires a system-level approach [91–93]. Key systemic features combatting burnout include high-quality leadership, strong teamwork, and efficiency of practice [63].

Enacting safety culture

Safety culture is enacted when the emphasis on safety is translated into meaningful practice by front-line health care workers. In enacting safety culture, threats to safety are highlighted and resolved through effective interpersonal processes. (team work, mindful organizing, and relational coordination) [7]. Interventions that support enacting safety culture focus on improving the capability of health care teams to identify and proactively address potential safety threats.

Team training refers to a set of structured methods for optimizing teamwork processes such as communication, cooperation, collaboration, and leadership [94]. Team training strategies are particularly relevant to the NICU setting, given that team work climate has been shown to vary significantly across NICUs and inversely associated with healthcare- associated infections [95–97]. Team strategies and tools to enhance performance and patient safety (TeamSTEPPS®), a team training program developed by the US Department of Defense and the Agency for Health Care Research and Quality (AHRQ) is a prominent example of interventions to improve team-related dimensions of safety culture [98]. TeamSTEPPS® emphasizes the knowledge and skills that comprise effective teamwork such as situation monitoring, mutual support, and communication [98]. Significant training costs remain a drawback to more widespread implementation of TeamSTEPPS® intervention.

Mindful organizing, derived from field research on nearly error-free, high-reliability organizations such as nuclear power plants, forms a framework for front-line employees to work together to improve safety culture [99]. Mindful organizing consists of five interrelated organizational processes: preoccupation with failure; reluctance to simplify interpretations; sensitivity to operations; commitment to resilience; and deference to expertise [100]. Introducing these high-reliability practices has been shown to improve care delivery outcomes [101, 102].

Relational coordination refers to timely, problem-solving communication by team members across function under conditions of high-interdependence, uncertainty, and time constraints [103, 104]. Improving coordination at care transitions, checklists, and standardized protocols are

examples of efforts to improve safety culture by improving the relational coordination of processes in the NICU [103, 105]. For example, improving coordination by implementing a structured handoff intervention has been shown to reduce medical errors and preventable adverse events [106].

Safety culture can also be enacted using strategies that combine multiple interventions. For example, the Comprehensive Unit-Based Safety Program (CUSP) [21] pairs behavioral interventions related to team work and communication with evidence-based clinical care algorithms to improve patient safety outcomes as well as safety culture [36, 107–109]. Comprehensive patient safety programs have been shown to improve safety culture, decrease patient harm and reduce serious safety event rates as well as severity-adjusted mortality rates [53, 110].

Elaborating safety culture

Elaborating safety culture refers to enlarging and refining interventions, in order to create a long-term process of change. Elaborating includes institutionalizing successful change practices and a reflective, thoughtful, approach to identify new areas of improvement [111]. Elaborating safety culture, is the process of putting in place structures and processes that permit reflection on safety outcomes and set the stage for continuous improvement. In contrast to interventions that focus on a specific attribute of safety culture such as improving teamwork, and communication, interventions that elaborate safety culture, take a systems approach. Elaboration facilitates a structured process of learning and improvement through use of strategies such as root cause analysis, failure mode and effects analysis and morbidity, and mortality conferences (MMC). Forums such as MMC can serve as institutional settings in which system-based issues that contribute to adverse events are identified and addressed through process improvement [112]. In addition to their traditional educational role, MMC can function as a reflective space for a structured inquiry into causes for errors and for exploring and implementing potential solutions [113–115]. System-focused interventions drawn from industrial production such as the Toyota Production System and lean manufacturing principles [116], can also help create infrastructure to improve reliability of care processes, empower front-line staff, and reinforce a culture of safety.

In selecting safety culture interventions, attention must be paid to the fit between the intervention and the NICU context. Although, practitioners have a range of potential interventions to consider, few have been evaluated in the NICU with rigorous study designs. The formal testing of safety culture interventions specifically for the NICU setting will add to the evidence base and to the wider adoption of these strategies to improve safety culture.

Sustaining change

Changing the safety culture of the NICU is a long-term process that requires attention, time, and resources. The initial efforts of measurement, identifying strengths and opportunities, and implementing specific interventions, should lead to institutionalized structures that enable ongoing measurement, help reflect on progress and set the framework for continuous improvement. Key to the sustaining change, is getting buy-in and commitment from all the key stakeholders, including the staff, leadership, and hospital management to commit to the long-term process of change. Sustaining change also requires celebrating achievements, and carefully setting the stage for the next improvement cycle through a nuanced understanding of the strengths and challenges of the NICU, and building on current capabilities. The trajectory, and process of change might be different for different NICUs, but common elements of a sustainable process of change are buy-in from staff, leadership behaviors that reinforce priority placed on safety, including providing appropriate incentives for change, and a clear demonstrated institutional commitment to change through provision of resources.

Summary

NICUs are a high-intensity care setting where fragile infants undergo multiple, complex procedures over an extended period of time, requiring coordination from caregivers from different subspecialties. In this setting, it is critical that "the way we do things around here" reflects the priority placed on delivering safe, high quality care. We also know that safety culture varies across NICUs. Decades of work, building on lessons drawn from high-reliability industries, has shown that safety culture can be measured, that it is responsive to targeted interventions, and that it is associated with clinical and operational outcomes. Changing the safety culture of the NICU requires a systematic approach that seeks and builds on buy-in and commitment from all levels of NICU staff and management, for a long-term, sustainable process of improvements in safety cultures and outcomes.

Compliance with ethical standards

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