A model for developing high-reliability teams

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Introduction

Nursing plays a central role in ensuring that patients consistently receive high-quality care and are protected from injury at all times. It is well documented that health care is not safe for patients, and quality is not what it should be or what is desired. In the United States alone, estimates of unintended patient deaths range from 48 000 to 200 000 annually (Institute of Medicine 1999, Institute for Healthcare Improvement 2007), whereas patient injury is estimated to be approximately 15 million incidents annually (Institute for Healthcare Improvement 2007). Moreover, patients only receive about 55% of the care they should receive when they encounter the health care system (McGlynn et al. 2003).

One proven method of improving quality and safety is high-reliability theory, which consists of organizational design principles and management approaches that prevent patient injury and improve quality (Riley 2009). Characteristics of a high-reliability health organization (HRO) include an organizational commitment to safety, back-up steps built into processes, safety measures and an organizational culture for continuous learning (Weick & Sutcliffe 2001, Weick 2002). There is growing evidence that applying reliability principles...
to health care has the potential to help reduce flaws in care processes, increase the consistency with which appropriate care is delivered and improve patient outcomes (Cherouny et al. 2005, Benneyan et al. 2006, Riley et al. 2010).

A HRO provides safe care and is intentionally designed to minimize errors (Gauthier et al. 2006) while achieving exceptional performance in quality and safety (Institute of Medicine 1999). Reliability is defined as defect-free operations (Reinertsen & Clancy 2006) and a HRO is one that functions in a hazardous environment, yet is essentially error-free for long periods of time (Roberts 1990). High reliability is especially necessary in health care, where the consequences of errors are high, but the frequency of occurrence is low (Baker et al. 2006). Safe care units are characterized by a decreased likelihood of system error and medical accident (Knox et al. 2000). In HROs, safety is the hallmark of organizational culture and professional behaviour (Weick 2002).

How patient injury occurs

The greatest danger to patient safety comes from incidents involving contributions from many different people distributed over time. These events occur widely throughout the system, are hard to predict and foresee (Reason 2005), and are therefore extremely difficult to control. Although patient injury may be a rare event which occurs infrequently for the individual provider and care team, for the health care industry overall, the incidence of patient injury is at epidemic levels. Catastrophic accidents in health care are caused by an insidious combination of unexpected factors, hardly significant in themselves, but devastating in combination or the right sequence (Reason 2005).

High reliability patient care unit

We first present the features of a high-reliability patient care unit, followed by a discussion of the team training and system design necessary to achieve high reliability. While high reliability for health care has been extensively researched in recent years, a comprehensive operational model for achieving high reliability has not been developed. Figure 1 shows four components that are necessary for achieving high quality and ensuring patient safety: (i) technical skills, (ii) non-technical skills and (iii) process design, all (iv) embedded in a culture of safety. We discuss the contribution of each of these four components.

Technical skills

Health care providers are highly trained and remarkably committed. The health professions (nursing, medicine, pharmacy, laboratory technicians, radiology technicians and so forth) have developed intensive training curricula in accredited university programmes with government jurisdictions granting licensure to practice with ongoing certification requirements by professional associations. This consistently high level of technical training and skill is perhaps the best-developed component of health care reliability. Indeed, health care quality and safety would be at worse levels if not for the tremendous technical training and commitment of individual care givers. However, the technical skills and commitment of individual providers cannot counter-balance the complexities of the health care systems (Nolan et al. 2004), the high variability in healthcare team membership (Miller et al. 2008), variation in leadership of teams (Riley et al. 2008) or compensate for human fallibility (Reason 1995, Gosbee 2002). Moreover, the tenacious commitment to professional autonomy traditionally exerted by providers (Leape & Berwick 2005) can be inimical to patient safety. Indeed, the premium placed on autonomy may lead to adverse medical events. The foremost building blocks to be addressed before other solutions to unsafe care are the use of the equivalent actor principle and standardization of practices (Amalberti et al. 2005).

Non-technical skills

Non-technical skills (NTS) are the cognitive and interpersonal skills necessary to ensure safe patient care which supplement clinical and technical skills (Paisley
et al. 2001, Yule et al. 2007). We emphasize the importance of NTS to complement technical skill for safe and efficient task performance. Two of the foremost NTS in health care are communication and teamwork (Flin et al. 2008).

Poor communication and poor teamwork are major risks in perinatal units (Rice-Simpson & Knox 2003). Poor communication increases the risk of error 10-fold (Reason 2001) and our research indicates that poor teamwork accounts for approximately 55% of all active failures in a hospital setting (Riley et al. 2010). The importance of teamwork and communication in high-hazard environments such as labor and delivery units, the operating theater, intensive care units, and emergency departments.

**Designed processes**

High reliability is based on a premise that the right process will produce the right results (Liker 2004). Too often, care unit processes are haphazardly designed, created for the convenience of the organization and staff, or modified by workarounds (Berwick & Leape 2004). The cumulative result is a complex system of poor processes that fail to meet minimal expectations for quality and safety. By default, quality and safety depend on the commitment, training, expertise and judgment of individual professionals. In such cases, safety and quality are not properties of the system (an essential feature of a HRO), but are properties of personality and individual diligence. When high-reliability processes are created and used in health care, quality and safety become properties of the organization as well as commitment by the individual provider.

The design of a process determines both its effectiveness and efficiency. While healthcare processes should be designed to compensate for the limits of human ability (Nolan et al. 2004), processes are rarely designed for quality and safety (Shortell et al. 2005). All patient care is the result of a process, defined as a series of steps to produce an outcome. All processes transform inputs into outputs. There are two basic types of input elements: the object of transformation (the patient) and the transformation mechanisms (people, supplies, equipment and buildings). The process transforms these input elements into patient care services (outputs). The absence of ‘perfect processes’ (Shortell et al. 2005) contributes to an insidious deterioration in healthcare system performance making timely intervention difficult (Gauthier et al. 2006).

In most industries, a production process is carefully designed, tested, audited and monitored on an ongoing basis using sophisticated process engineering techniques (Montgomery 2005). However, in health care, members of a care unit rarely take the time to review specific processes of care that are repeated regularly in the system (Nelson et al. 2007). Applying rigour to health care process design and analysis is still in its infancy and is not yet commonplace. One promising development in health care process design is the concept of the clinical microsystem, the smallest organizational unit where patient needs are met. A clinical microsystem is the basic building block of care where the competency of the professional is connected to the needs of the patient (Nelson et al. 2007). Such microsystems can serve as HROs where good value and safe care are realized by making it easy to do the right thing (Godfrey et al. 2003). Currently, a lack of knowledge by staff to the nature of variability and internal processes contribute much to the poor reliability within a microsystem (Nelson et al. 2007). Given this situation, greater attention to process design is integral to improving reliability.

**Culture of safety**

A culture of safety (COS) is an integrated pattern of individual and organizational behaviour, based upon shared beliefs and values, that continuously seeks to minimize patient harm that may result from the processes of care delivery (Kizer 1999). A COS encompasses four elements: (i) shared beliefs and values about the health care delivery system; (ii) an organizational commitment to detecting and analyzing patient injuries and near misses; (iii) open communication regarding patient injury results, both within and outside the organizations; and (iv) the establishment of a just culture and a measurement strategy that is fair. The success of a COS in ensuring patient safety is contingent on individual health care professionals working and training together in interprofessional teams and assuming personal responsibility for ensuring safe practices. The unmet challenge is to create a safe environment where caregivers from all professions are accountable to promote safety as a system property.

Culture is the shared perceptions of the individuals within a team or an organization about what is good, right, important, valued, supported or expected at any given time. Individuals may perceive their culture as
‘this is the way we do things around here’. Culture can be shaped by policies, procedures, observed practices and personalities within the leadership. Each individual plays a part in shaping a culture of safety. A culture of safety requires that each individual at the point of care asks themselves ‘to what extent is safety of patients a priority to me every day with every patient encounter?’.

The individual team member and high reliability

Members of high-reliability teams (HRTs) exhibit four key behaviours: (i) situational awareness, (ii) use of standardized communication, (iii) closed-loop communication (CLC) and (iv) shared mental model. High reliability requires not only knowing how to use these individual skills but also requires the practitioner to know ‘when’ to use them (Davis et al. 2009, Miller et al. 2008).

The ‘when’ is a moment that can be called a critical juncture, a point in time that requires the individual team member to recognize contextual cues in the environment. There are four primary critical junctures: when new team members are arriving, when the condition of the patient is changing and help is needed, when the patient is moved to a new environment, or when a need for interdepartmental collaboration. Communication and teamwork skills are necessary countermeasures to reduce risks at each of these critical junctures. These skills help to create HRTs which do not rely solely on an individual’s recognition of contextual cues.

In previous research, we established that the performance of teams throughout critical events is sporadic and uneven (Riley et al. 2008, Miller et al. 2009). Four main human factor and communication failures account for the bulk of this inconsistent performance: loss of situational awareness by a team member, inadequate standardized language (for example SBAR-R), lack of CLC and failure to establish a shared mental model. Table 1 lists these four key individual communication factors required of all healthcare workers to become better team members and illustrates how they can be simplified into an easily identified operational framework of ‘me-you-us’.

In this framework, situational awareness starts with ‘me’ the individual’s perception or mindfulness of the moment by an individual. Situational awareness is the ability of the individual to bring forth the meaning and level of urgency of an observation based on experience and training. The primary way that a team member can know another’s situational awareness is through explicit communication between them.

Standardized common language is needed for clear communication. This interchange now includes ‘you’. There are two types of standardized communication: SBAR communication (outward) and CLC (inward). The outward SBAR communication and inward CLC create an understanding and accountability for another team member, ‘you’. A common example of poor standardized language or more specifically the failure of a standardized response, is when an order is called out and no one responds. This simple failure to use CLC can result in zero, one, or two or more team members to carry out the order. If zero team members carry out the order, the team is at risk of being ineffective and increasing potential harm. If two or more carry out the order the team is at risk of being inefficient and again could cause harm. The relationship of standardized communication with effectiveness and efficiency is highlighted when a simple practice is not performed. Given a value equation of quality over costs, it is understandable how team behaviours improve value in healthcare settings.

<table>
<thead>
<tr>
<th>Table 1: Key communication factors</th>
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<tr>
<th>Individual human factor competency</th>
<th>Definition</th>
<th>The framework</th>
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<tbody>
<tr>
<td>Situational Awareness (SA)</td>
<td>Conscious, mindful observation of one’s own environment or recognition and meaning given of patient condition.</td>
<td>ME</td>
</tr>
<tr>
<td>Use of Standardized Communication (Out to the environment) Example: Situation, Background, Assessment, Recommendation-Response (SBAR-R)</td>
<td>Technique of communication about a critical situation that involves clear specification of situation-back ground-assessment-recommendation-response</td>
<td>YOU</td>
</tr>
<tr>
<td>Use of Standardized Communication (In from the environment) Example: Closed-loop communication (CLC)</td>
<td>Communication to a specific person that is acknowledged by the receiver and then affirmed by the sender (e.g. verbal order read back)</td>
<td>YOU</td>
</tr>
<tr>
<td>Maintaining a Shared mental model (SMM)</td>
<td>Characterized by an articulated common understanding of the problem, the plan, and the risk. The s ina qua non of a team</td>
<td>US</td>
</tr>
</tbody>
</table>

Standardized communication is the way an individual team member begins to create, establish and maintain a shared mental model (SMM). A SMM begins when questions are clarified, decisions and plans verbalized, risks reviewed and accountability established. The collection of individuals is no longer merely a group of people; they have become a team or ‘us’. A shared mental model is the *sina qua non* of the team. It is of paramount importance to include the patient as part of the team.

**A model for creating HRTs**

Interdisciplinary team training is a foremost technique for nursing to institute high reliability in health care (Knox & Simpson 2004, Salisbury & Simon 2004, Baker *et al.* 2006). Strategies to train HRTs with specific knowledge, skills and attitudes must focus on training the individual to become an effective team member, as opposed to training a discrete team to competency (Miller *et al.* 2008). Simply installing a team structure does not automatically ensure it will operate effectively (Salas *et al.* 2000, Baker *et al.* 2005, Henriksen & Patterson 2007), in part because health care professionals are predominately educated as individuals and trained separately within their disciplines (Henriksen & Patterson 2007). There is wide reliance on the expertise of an individual, not on integrated teams of experts that work together on an agreed-upon plan of care (McIntyre & Salas 1995, Burke *et al.* 2004). However, a team of health care experts is not an expert team (Riley *et al.* 2008) and safety is created by interdependent teams (Knox & Simpson 2004). Transformation of healthcare requires expert teams providing patient care in a dynamic culture that embraces organizational learning every day. Figure 2 shows a model for creating HRTs.

This model combines TeamSTEPPS team training (Agency for Healthcare Research and Quality 2007), Just Culture (Marx 2001), and *in situ* simulation training (Davis *et al.* 2008) to build adaptability and resilience in healthcare settings. The great variability of team composition, in highly complex settings, are conditions that require HRTs. The model provides a framework for creating HRTs by increasing the non-technical skills of individuals.

**Identifying error: experiential learning**

*In situ* simulation is an experiential training strategy that takes place on a patient unit rather than in a laboratory. The simulation recreates, as closely as possible, the real world environment, equipment and psychological reality for the participants. The individual and the team experiential nature of *in situ* simulation allows for the systematic acquisition of skills and skill assessment, improves attitudes about why team performance is so critical to safety, and uncovers process design or environmental conditions that cause gaps in patient safety. Adults want to make sense of what they experience or observe. *In situ* simulation provides the experienced clinician a context in which to be actively engaged in the care processes and experiences that involve not only concrete clinical events, but also transactional events that have emotional ramifications.

The *in situ* simulation exercise models team behaviours of briefing, huddle and debriefing. The exercise begins with a briefing to prepare the team for the simulation, affirms expectations and promotes a safe learning experience. Team members huddle during the simulation to make contingency plans when new changes in clinical conditions occur, call for additional resources and respond to the emergency. The *in situ* simulation is always followed by an extended debriefing session where multidisciplinary participants have the opportunity to view their interactions on videotape and to identify communication, teamwork and process breaches. This allows the participants to personally reflect on the active experience and close the gap between that experience and understanding it in terms of teamwork and communication.

Identification of error can occur in many ways, but in this model we *use* *in situ* simulation as an experiential process and observation tool. *In situ* simulation allows the participants to discuss their teamwork and communication, resulting in a participant-led accounting of process errors and improvements. As a result both non-technical skills and newly designed processes can be
evaluated at the same time. During in situ simulation training, team members learn to appreciate in what clinical context they need to use the four individual non-technical skills found in Table 1. The information gathered at debriefings of in situ simulations can be used to design new processes or new training techniques. Prioritization of the errors identified during in situ simulation can then be used as a Failure Modes and Effects Analysis (Davis et al. 2008). Error identification by the team members themselves promotes more self-reflection, and places emphasis on the need for all team members to focus on and report error during their routine work.

**Mitigating error: utilizing teamwork skills**

TeamSTEPPS is an evidence-based teamwork curriculum developed by the Department of Defense in collaboration with the Agency for Healthcare Research and Quality (2007). The curriculum is based on four learnable, teachable skills to improve team performance: Leadership, Situation Monitoring, Mutual Support and Communications. The curriculum affirms the importance of interdisciplinary teams being trained together rather than separately according to different disciplines. Table 1 distills TeamSTEPPS into a framework of an adaptable application to be utilized in combination with in situ simulation. The ‘me, you, us’ formulation provides a much more simplistic and easily remembered concept for anyone on the healthcare team. TeamSTEPPS can provide the lexicon (what we know) and in situ simulation provides the environment to utilize these non-technical skills (what we do). When TeamSTEPPS is combined with the experiential nature of in situ simulation, participants can practice the context within their own work environment to successfully utilize these vital non-technical skills for high-reliability teams.

**Managing error: Just Culture**

HRTs require a context such as Just Culture (Marx 2001, Just Culture Community 2010) within the larger organization to flourish. Just Culture is a framework that bases the response to poor outcomes on the behavioural choices of the team member(s) involved and not on the severity of the outcome. The single greatest impediment to error prevention in the medical industry is that people are punished for making mistakes (Leape 2000). Furthermore, healthcare providers often only report what they could not hide. The current culture in many healthcare settings typically demonizes the dedicated professional that made the error. Problems solved in this manner do little to foster learning (Leape 2000).

Just Culture contends that a better way to deal with adverse events is to expect errors to occur. The severity of the error is analysed through a systematic approach that reviews the behavioural choices made by team members (Marx 2009). A Just Culture is core to a culture of safety and integral to improving team dynamics and interactions of team members. It is a way of thinking that balances the accountability of an individual for behavioural choices with that of leaders who aim to design safe systems. It acknowledges the differences between human error, at risk behaviour, and reckless conduct. Each requires a different approach within a context of learning. A person who has a lapse and commits a human error is consoled; a person who does not appreciate or know the risk and makes a poor behaviour choice is coached to make a better choice next time; and a person who consciously disregards a substantial and unjustifiable risk is negligent and is subject to disciplinary action. Just Culture supports and encourages open and honest reporting of near misses and occurrences. A Just Culture is based on an organizational learning approach that strives to prevent future error through better understanding and management of error.

**Conclusion**

Simple system failures, combined with omission of clear interdisciplinary communication, cause most cases of serious patient harm (JCAHO 2002, Altman 2003). Nursing leaders at all levels are challenged to develop structured relationships within interdisciplinary teams as well as create processes designed for safe patient care at the clinical microsystem level. By making each clinical microsystem highly reliable, the overall organizational effectiveness will improve. Safeguards of existing systems have been outstripped by the complexity of contemporary medical care (Leonard et al. 2004). Nurses are at the sharp edge of ensuring patient safety. It is imperative for leaders to supplement technical skills with non-technical skills and designed processes, all embedded in a culture of safety in order to achieve high reliability for patient care.

HRTs are necessary precursors for a health care facility to become a HRO. The model we present is a map for leadership that shows how to create HRTs with well-established tools already available that can be used to achieve a culture of safety on a healthcare unit. HRTs are not developed in a management and leadership
vacuum. Managers and leaders are the champions for patient safety responsible for implementing HRTs. While the TeamSTEPPS curriculum is an excellent evidence-based resource for clinic managers, didactic learning has limited value for working professionals; experiential learning is best for adult learners. Leaders can use TeamSTEPPS in an abbreviated manner to give practitioners an essential set of tools to employ.

In situ simulation produces experiential learning for team members and can be used to reinforce the communication and teamwork tools found in TeamSTEPPS. Although nursing leaders are champions for this work, it requires physician engagement as well. In situ simulation is a powerful way to engage a multi-disciplinary group and allows different professions to see how others perform non-technical skills in their work environment. Starting an in situ programme requires a change team composed of nurse leaders and physicians who can motivate and coordinate others to examine their work. Leaders need to employ coaching to initially achieve this work. As a culture of safety takes hold, more coaches will appear (formal and informal leaders) who will be essential to sustaining the work. Just Culture principles will be another task for leadership as very often this will require a new approach to error management and thus new thinking about culture in general. It will be up to managers, with leadership support, to employ principles that do not immediately resort to blaming and training employees. Consoling, coaching and communicating will be the expectations of management if a new culture is to be established.

References


