Identifying key nursing and team behaviors to achieve high reliability

Article in Journal of Nursing Management · April 2009

Impact Factor: 1.5 · DOI: 10.1111/j.1365-2834.2009.00978.x · Source: PubMed

3 authors, including:

Kristi Miller
Fairview Health Services

Available from: Kristi Miller
Retrieved on: 13 May 2016
Identifying key nursing and team behaviours to achieve high reliability

KRISTI MILLER RN, MS¹, WILLIAM RILEY PHD² and STANLEY DAVIS MD, FACOG³
¹System Director of Clinical Safety, Fairview Health System, Minneapolis, MS, ²Associate Dean, Division of Health Policy & Management, School of Public Health, University of Minnesota, MN and ³Medical Director of Teamwork & Simulation, Fairview Health System, Minneapolis, MN, USA

Introduction

High-reliability theory has become increasingly prominent in health care to help improve quality and safety for patients. While nursing has been a central component of interdisciplinary efforts to increase health care reliability there has been no examination of the specific role of nurses in high reliability as it relates to their specific competency and accountabilities. In the present study, we examine the nursing contributions to high reliability in interdisciplinary teams using in situ simulation to explore specific nursing behaviours.
essential for ensuring patient safety. During critical events, we used high fidelity, *in situ* simulation to examine patterns of team communication and performance. High-fidelity simulation has been defined as the degree to which the simulation replicates the clinical, physical and psychological reality of the real-life clinical setting (Miller et al. 2008). Our aims were to (1) identify key behavioural markers for nurses in interdisciplinary teams during several stages of team formation and reformation – points at which the team assembles, reconfigures, and reassembles to complete a task and (2) assess the interdisciplinary team performance of nurses at key junctures during selected phases of critical incidents.

Nursing leaders at all levels of organizations are challenged to develop cohesive, structured relationships within interdisciplinary teams as they attempt to create processes designed for safe patient care. However, simple system failures, combined with omission of clear interdisciplinary communication, cause most cases of serious patient harm (Altman 2003, JCAHO 2002). 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; however, little is known about how reliable a nurse performance is on interdisciplinary teams (IOM 2003).

**Interdisciplinary teams and safety**

Teams make fewer mistakes than do individuals (Smith-Jentsch et al. 1996, Salas and Canon-Bowers 2000). However, most clinical units continue to function as discrete collections of individuals (Knox & Simpson 2004) in part because health care professionals are predominately educated as individuals and trained separately within their disciplines (Henriksen & Patterson 2007). There is a universal reliance on the expertise of an individual, not on integrated teams of experts that work together on an agreed-upon plan of care (Burke et al. 2004, McIntyre & Salas 1995). The training of individuals is a different undertaking when contrasted with the training of teams (Reason 1997, Hamman 2004). The health care professions are extremely adept in training individuals in the technical aspects of each discipline, yet have been slow to train for team skills for enhanced interdisciplinary team performance (Salas et al. 1997, Baker et al. 2006). Acquiring proficiency for individual performance skills involves task training, whereas team training involves behaviours that professionals must acquire to function effectively as part of an interdependent team (Salas 2000). Simply installing a team structure does not automatically ensure it will operate effectively (Salas 2000, Baker et al. 2005, Henriksen & Patterson 2007). Team failures occur because the health care teams work in complicated systems, where safety is assumed, and not assured. Many healthcare teams do not have stable membership or constant leadership. This team composition variability is the prime impediment to the high reliability required for consistent and safe care (Miller et al. 2008).

The Institute of Medicine (IOM) (Smith-Jentsch et al. 1996, Burke et al. 2004, Agency for Healthcare Research and Quality 2007), in its examination of medical errors and patient safety, concluded that the nature, characteristics and communications patterns of health teams, while important, remain poorly understood. The IOM indicated that the quality of communication among health care team members varies significantly and that this variability has important consequences for patient safety. In order for health care organizations and professionals to improve their performance in critical events, team dynamics must be understood far better, and opportunities for more effective communication must be described. Catastrophic patient injury often occurs as a result of an unanticipated sequence of active failures and latent conditions that are difficult to foresee (Reason 1997). Documenting and analysing potential risks are essential for improved patient safety. Accomplishing this goal requires an effective method to identify risks and an easily understood approach to manage risks (Welborn 2007).

**Methods**

This study describes the *in situ* simulation training session as a method to measure markers of key nursing behaviours in an interdisciplinary team during critical events to assess the extent of high reliability. The nursing behaviours observed were: situational awareness, situation, background, assessment, recommendation-response (SBAR-R) and closed-loop communication and shared mental model.

**Setting**

After securing Fairview Health Services and University of Minnesota Institutional Review Board (IRB) approval for research involving human subjects, we conducted 17 trials of *in situ* simulation involving obstetric and neonatal emergencies at four Fairview Health Services hospitals located in MN, USA from September 2007 to March 2008. These included both rural and urban,
and teaching and non-teaching hospitals. Simulations took place in the labour rooms of these hospitals and as the scenario required, moved through the hospital hallways and sometimes to different floors where the operating room was located. Each simulation involved an average of 20 persons for a total of approximately 420 participants from the medical staff and hospital staff.

Participants

The in situ simulation trials involved a multi-disciplinary cadre of personnel from the hospital staff. Participants included obstetricians, labour and delivery and special care nursery nurses, neonatal nurse practitioners, anaesthesiologists, certified nurse anaesthetists (CRNA), unit secretaries and operating room staff for every simulation. Two people from other departments in the hospital or family members of labour and delivery staff were recruited as confederates to play the roles of a labouring mother and a significant other for each trial. These actors were given scripted information ahead of time so that they could realistically play their roles. During the in situ simulation briefing, team members were instructed to call upon any hospital department or staff, such as the blood bank, the laboratory, backup surgeons, central supply, extra personnel, code teams, interpreters, respiratory therapy and others, so as to treat the patient just as they would during a true obstetrics emergency.

In situ simulation setup

Production of the in situ simulation required the use of a fetal heart tone simulator, a cervical dilatation teaching box, fake blood and video cameras. The normal paperwork from labour and delivery was used for documentation. Video cameras were placed in the labour and delivery room in a stationary fashion and as a handheld to capture all interactions of the obstetrics team. The handheld video camera captured all events as the patient was moved from the labour and delivery to the operating room. A full description of the methodology is described elsewhere (Davis et al. 2008, Miller et al. 2008, Riley et al. 2008).

In situ simulation scenarios

An obstetrician, a nurse researcher and a clinical nurse specialist created three scenarios based on actual sentinel events (Riley et al. 2008). Each scenario was designed to prompt non-technical team behaviours such as leadership, situational awareness, SBAR-R, closed-loop communication and shared mental model (Riley et al. 2008). The scenarios included typical distractions such as an overly inquisitive or rude significant other, a language barrier, talkative mother, lack of a prenatal record and other factors that interrupt team flow so that the simulation team would be stressed by both the clinical and social aspects of the care. Each simulation started with a briefing on labour and delivery discussing the simulation process, limitations and the importance of performing as one would normally perform during actual clinical care. Participants were told that the observers were looking for teamwork and communication skills, not for technical skills.

In situ simulations started with the nurse’s first encounter with the patient, often walking into the room with the patient. Simulations had a typical framework of one nurse and the patient, two nurses and the patient, the addition of an obstetrician, and taking the patient to the operating room for an emergency caesarean section. This framework became the stages of our evaluation. These ‘event sets’ (Hamman 2004) contained specific triggers (sudden clinical changes) and distractors (elements designed to divert the team’s attention) that created stress for team members (Miller et al. 2008).

In previous research, we identified six distinct stages with unique primary tasks. During each change in a stage or task or team, a significant leadership event occurred; leadership was established, maintained or transferred (Riley et al. 2008). The performance of these teams throughout the critical event was sporadic and uneven. Highly-reliable team performance regarding situational awareness, SBAR-R, closed-loop communication and shared mental model was not consistently observed. Previous research findings indicate that four main team human factor and communication failures account for the bulk of the breaches in defensive barriers during critical events: loss of situational awareness by the team leader, inadequate SBAR-R (a handoff technique), lack of closed-loop communication and failure to establish a shared mental model (Davis et al. 2008, Miller et al. 2008). Table 1 lists these four communication factors with a definition and clinical example.

Data from video recorded observations

Utilizing three stages of evaluation for the in situ simulation, and focusing on the four human factor elements noted above, allowed for a regimented video review. All videos were reviewed in their entirety by at least two clinical experts, either a registered nurse or an obstetrician, but were stopped at the end of each stage, so as
to score the behaviours exhibited by the primary nurse. Behaviours were scored independently, and consensus was achieved through interactive discussion. We selected the initial three stages because this is where the nurse is most central as a key leader and dominant member of the interdisciplinary team.

Stages were determined as follows:

Stage I Primary nurse meets patient until secondary nurse enters room.
Stage II Secondary nurse enters room until obstetrician enters room.
Stage III Obstetrician enters room until code C-section is called.

Video was not re-reviewed, but an ‘event set evaluation sheet’ was used as needed to score behaviours during the video review. Video from different in situ simulations was reviewed randomly in regard to date or institution.

Statistical analysis

We used descriptive statistics to assess the qualitative data derived from the film study. The film study data were compiled and analysed with frequency distribution converted into percentages in order to standardize the comparisons between the three stages of group formation.

Results

We present the findings from the four behavioural markers analysed during the first, second and third stages of three different simulated critical incidents. The key markers are: situational awareness, use of SBAR-R, closed-loop communication and team-shared mental model.

Situational awareness

Situational awareness of the individual nurse is assessed by observable communication that occurs with the patient and other members of the care team. Figure 1 shows wide variation in seven markers related to situational awareness during stages one, two and three of a simulated critical event. Two behavioural markers are consistently observed (nurse introduces self 93% of the time and prioritizes tasks 93% of the time) whereas distractions from critical tasks are minimized 80% of the time. Four behavioural markers for situational awareness are not consistently observed: the nurse verbalized changes in maternal and fetal condition (65% of the time), requested backup when needed (62% of the time) and verified gestational age (53% of the time). Verification of critical information was very inconsistently observed, only 19% of the time.

---

**Table 1**

<table>
<thead>
<tr>
<th>Competency</th>
<th>Definition</th>
<th>Behavioural example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Situational awareness (SA)</td>
<td>Conscious, mindful observation of one’s own environment or recognition of patient condition</td>
<td>Circulator entering the Operating room for Code Caesarean section can become ‘task saturated’ and have to ‘multitask’ for patient preparation for surgery. SA is maintained when he/she asks for help</td>
</tr>
<tr>
<td>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>Physician speaks directly to the Circulator by name, requests 2 units of O Neg blood STAT. The nurse replies ‘I will order 2 units of O neg blood right now.’ Physician answers ‘yes that’s right’</td>
</tr>
<tr>
<td>Situation, background, recommendation, response (SBAR-R)</td>
<td>Technique of communication about a critical situation that involves clear specification of situation-background-assessment-recommendation-response</td>
<td>S: The patient has intense supra pubic pain, bleeding B: She is a VBAC A: I think she may be rupturing R: Do you want me to call the OR team for a Code CS? R: When can I expect you?</td>
</tr>
<tr>
<td>Shared mental model (SMM)</td>
<td>A team trait characterized by an articulated common understanding of the problem and/or the plan.</td>
<td>Code Blue for a mother with amniotic fluid emboli-obstetrician states: How long has she been down? If there is no response, we need to get her into the OR within 5 minutes to save the baby. The Code team agrees</td>
</tr>
</tbody>
</table>

AHRQ (2007), Miller et al. (2008), Riley et al. (2008).
Closed-loop communication

Figure 2 shows eight key closed-loop communication behaviours during the initial three stages of a critical event. These eight behavioural markers measure whether the nurse provided verbal read back in order to ensure that critical communications were both sent and received. The findings again indicate that wide variation

![Figure 2](image-url)
in nurse performance is observed. Closed-loop communication by the nurse ranges from a low of 14% for verbal order read back (see Table 1) during Stage Two to a high of 69% responding to questions and requests during Stage One.

**SBAR-R**

SBAR-R is a communication technique that is essential for effective handoffs of critical information. Figure 3 shows the results of SBAR-R communication by the nurse during Stages One, Two and Three of a simulated critical event. The findings show that the effective use of an SBAR-R to other team members does not consistently occur during any of the three stages. It was not done 65% of time in Stage One, 46% of time in Stage Two and 57% of time in Stage Three.

**Shared mental model**

During the three stages of a simulated critical event, we examined a shared mental model of the team with seven items. A shared mental model enables the team members to communicate their individual situational awareness, check out information with other team members and arrive at a common understanding of the patient’s condition and the plan of care. Figure 4 shows low performance on establishing a shared mental model by the interdisciplinary team but substantially less variation than the other three dimensions in the study. During Stage One, the nurse created a shared mental model over half of the time as measured by verbally verifying mothers medical condition (56%) and the care plan rationale (56%), whereas key information regarding the mothers condition was verbalized slightly more frequently (61%). During Stage Two the nurse established direct communication with the physician most of the time (87%) but performed lower on clear exchanges with the mother (67%) and reporting key information (57%).

**Discussion**

The four key behavioural dimensions examined in this study (situational awareness, closed-loop communication, SBAR-R communication and shared mental model) suggest that nurses have not achieved the performance required to constitute high reliability. For example, situational awareness reflects conscious, mindful observations of the environment and recognition of the patient’s changing condition. The nurses in our study performed consistently on some elements of situational awareness (over 90% in introductions and prioritizing) but performed very poorly in verifying critical safety information. During closed-loop communication, which is a technique to specifically acknowledge a message by the receiver and then affirmed by the sender through verbal read backs, a key behavioural marker occurred <15% of the time.

Closed-loop communication is an essential feature of high reliability and one of the key 2009 patient safety goals of the Joint Commission on Accreditation of Healthcare Organizations (JCAHO 2002). While closed-loop communication is required 100% of the
time in some settings (e.g. pilot communication to air traffic control) it is not practiced consistently in health care. A key element of a highly reliable team is that everyone has the same understanding concerning clinical information that is vital to patient care. When one caregiver does not verify that information is correct or seek to understand information that may be vague, then a mistake in decision-making may occur. The skill and timing of using closed-loop communication can be taught and used as a critical team behaviour.

During critical events, predictable patterns of team formation occur (Riley et al. 2008). The effective use of the communication tool SBAR-R at critical junctures of team formation (new members arriving) or reformation (the movement of a patient to another location or a clear change in patient condition) does not consistently occur during any of the three stages. It was not done 65% of the time in Stage One, 46% of the time in Stage Two and 57% of the time in Stage Three. The Stage Three SBAR-R is perhaps the most critical one because it is between the nurse and the physician who is coming to the bedside to assess the nature of the clinical condition of the patient and will decide actions based on this information. When the physician enters the room, he/she is multitasking (meeting the patient, family, hearing clinical data, assessing the fetal monitor data) and may be distracted and not take in the clear information if the nurse is silent or does not give a clear SBAR-R. The potential for this breach in safety occurred 35–54% of the time.

The findings show slightly more consistent performance on establishing a shared mental model. The nurse verbalized her/his situational awareness to the patient, family or other healthcare worker regarding the mother’s condition, history or plan only 56–67% of the time. However, even although the nurse did not communicate a sense of urgency regarding the patient condition, a direct communication was set up with the physician and reported findings 87% of the time. During Stage Three, either the physician or the nurse verbalized to each other or to appropriate caregivers the essential information about the mother’s condition or plan of care 87% of the time. It is noteworthy that in 13% of the time, this was not done which could mean that there would be a breach in safety which could affect timely and safe care of the patient.

The lack of high reliability or consistent performance by the primary nurse on all four dimensions may be a function not only of the complexity of the team dynamics in a critical event but also lack of role clarity, human factor limitations (multitasking, deference to hierarchy, task fixation) or inability to know when to use communication skills and team behaviours. Most healthcare professionals, including nurses, are not taught when to recognize environmental cues which should trigger heightened vigilance or use of clear communication or teamwork skills.

<table>
<thead>
<tr>
<th>Not done (percent)</th>
<th>Partially done (percent)</th>
<th>Done (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage one</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RN verbally verifies mother’s medical condition and history</td>
<td>6</td>
<td>38</td>
</tr>
<tr>
<td>RN verbalizes rationale for patient care plan and tasks</td>
<td>17</td>
<td>25</td>
</tr>
<tr>
<td>RN reports key information re: mother’s condition</td>
<td>15</td>
<td>23</td>
</tr>
<tr>
<td>Stage two</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RN reports key information re: mother’s condition</td>
<td>14</td>
<td>29</td>
</tr>
<tr>
<td>RN establishes direct communication with MD</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Stage three</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RN/MD verbalizes essential information about mother’s condition, including plan</td>
<td>13</td>
<td>87</td>
</tr>
</tbody>
</table>
Limitations

Several limitations of this study can be identified. First, we created scenarios to reproduce behaviours that occur in real situations and implemented them in actual care units. Although in situ simulation is considered a high-fidelity research and training strategy, there may be features missing from authentic team performance. Second, our study focused on ‘forced errors’ – errors made under the pressure of having to respond under crisis conditions of incomplete information, time pressure and unpredictable patient behaviour (Schulman 2002). These forced error conditions were intentionally created by our event sets and the findings may not be generalized to normal conditions. Further research is needed to determine if these findings are an artefact of the conditions, or whether they can be generalized to more routine clinical situations.

Conclusions

These findings contribute to the large body of teamwork research by further understanding the nature and complexity of critical events teams in health care and how the individual caregiver such as the nurse can impact safety of the patient at the point of care. These results suggest that both individual training of nurses and communication and team training is needed to impact the achievement of a highly reliable organization. Despite all the efforts dedicated to improving patient safety in recent years, there is little empirical evidence to show that outcome improvement has resulted (Vincent 2008). Significant improvements in safety will not occur until tangible improvements in team performance occur on a sustained basis at the micro-system level of the organization (Godfrey et al. 2003).

Implications

Nursing leaders continually search to improve patient safety and there are several important implications of this research. First, these findings further inform us about how key nursing behaviours are performed or omitted during critical events. Second, the technical skills of nurses may be secondary to non-technical skills in the performance of high-reliability health care. A large body of research indicates that technical proficiency is typically not the root cause of patient injury (JCAHO 2002). Rigorous nursing education, licensure and professional standards ensure high performance of technical skills, but team skills based on human factors research are at more inchoate levels of development. Third, improved patient safety requires an accurate understanding of how interdisciplinary teams function and the role that nurses have in helping to achieve high-reliability performance. Fourth, although a number of research approaches can be used to identify patient safety risks (Battles & Lilford 2003), the use of in situ simulation to identify areas where reliability of nursing non-technical skills is compromised has not been done.

In situ simulation is a research methodology that occurs on actual patient care units involving the usual healthcare team members and organization processes (Hamman et al. 2007). Unlike simulations that occur in a laboratory setting, in situ simulation results in a much higher fidelity (Salas et al. 1997, Salas 2000) and makes it possible to recreate stressful critical events in a safe situation, involving highly realistic scenarios requiring complex decision-making and interaction with multiple personnel (Gaba et al. 2001). The simulation recreates, as closely as possible, the real world environment, equipment and psychological reality for the participants. The individual and team experiential nature of in situ simulations allows for the systematic acquisition of knowledge of effective team concepts (what we think), skills in team behaviour (what we do and say) and attitudes about team performance (what we feel or value) (Miller et al. 2008).

Nurses have a key role in assuring effective team performance through the transfer of critical information. Nurses need to recognize and identify important clinical and environmental cues and act by communicating their own situational awareness to other team members in order to ensure that the clinical team progresses along the optimal course for patient safety with a team shared mental model. These actions often require assertiveness, but nursing leadership and communication must be employed in order for teams to begin to achieve high reliability in patient care. Such behaviours do not happen consistently and constitute breaches in defensive barriers for ensuring patient safety.

Simply installing a team structure with membership of expert professionals does not automatically ensure it will operate effectively. Team failures occur because the health care teams work in complicated systems, where safety is assumed, and not assured. Many healthcare teams do not have stable membership or constant leadership. This team composition variability is the prime impediment to the high reliability required for consistent and safe care. Until we normalize the training of expert individuals to become expert team members in both the undergraduate and professional environments, high reliability of patient care will not be achieved.
Acknowledgement

The authors wish to thank and acknowledge the contributions of Helen E Hansen, PhD, RN, University of Minnesota, school of Nursing, Minneapolis, MN, USA.

References

Agency for Healthcare Research and Quality. Team Strategies and Tools to Enhance Performance and Patient Safety. Team


Miller K., Riley W., Davis S. & Hanson H. (2008) In situ simul-


