LCC Session 12

CanMEDS Competency: Manager: LEADERSHIP & HIGH-PERFORMANCE TEAMS SESSION

Dr. J DellaVedova

What will happen in this session?

Large Group Session: led by Dr. J. DellaVedova

Icebreaker: Stand-up/Sit-down (5 min)

1. Assemble the entire group together
2. Invite individuals to stand up if the statement the facilitator makes applies to them, sit down if it does not:
3. Statements:
   - Some initial practice ones like, I have been to Newfoundland, I have seen a moose, I have failed a test at school, I have fallen asleep on the couch in the lounge, etc.
   - I like to take time to make sure I know exactly what the problem is before trying to solve it
   - I can come up with lots of creative ideas to solve a problem
   - I prefer to focus on details, rather than the big picture
   - I like to have as much data as possible before embarking upon solving a problem
   - I have a big imagination
   - I like a step-wise approach to solving problems
   - I need to weigh all the pros and cons before deciding on something
   - I work best when there is a time crunch
   - I get frustrated when people talk too much and don’t act
   - I love to put plans into action
Activity 1: Reading Discussion (10 min) (whole group)

1. What was the most interesting thing you learned from the readings? How might you use this in your clinical activities as a resident?

Activity 2: Tower Challenge (20 min)

Team Activity

Activity 3: Thinking Styles (25 min)

1. Facilitator gives presentation on Thinking Styles
2. Group discussion: In what ways did you demonstrate the thinking styles during the tower challenge? How might you use this knowledge to assemble and lead a team in the medical world?

Suggested Time 60 minutes.

Readings:


Enhancing Patient Safety in the Pediatric Emergency Department

Teams, Communication, and Lessons From Crew Resource Management

Christopher M. Pruitt, MD* and Erica L. Liebelt, MD†

Abstract: The fast-paced and multifaceted nature of patient care in the emergency department makes our discipline especially prone to errors and adverse events. In recent years, strategies such as formal communication and medical team training have been proposed as potential means to enhance patient safety. In many ways, practice dynamics particular to the emergency department make this setting almost ideal for implementation of these strategies. This article reviews concepts of communication and team training in medicine, including those learned from the aviation industry (known as crew resource management). Recent literature pertaining to teams and communication in medicine is reviewed.

Key Words: health care teams, mutual accountability, crew resource management, communication skills, TeamSTEPPS

(Pediatr Emer Care 2010;26: 942–951)

TARGET AUDIENCE

Healthcare personnel working in an emergency department (eg, Physicians, nurses, ancillary personnel).

LEARNING OBJECTIVES

After completion of this article, the reader should be able to:

1. Assess the components of effective medical terms, including components of crew resource management (CRM), particularly in the pediatric emergency department (PED).
2. Distinguish effective types of communication patterns one might use in the pediatric emergency department (PED).
3. Examine the existing scientific evidence that teamwork and improved communication patterns may improve patient safety in the emergency department (ED).

CLINICAL SCENARIO

Patients 1 and 2 are in adjoining beds in an open space in the ED, both with chief complaints on the electronic tracker board stating “Difficulty breathing.” In the evaluation of patient 1, physician 1 has ordered numerous laboratory tests and radiography, as the history is confusing and sparse in details, and the physical examination is not consistent with the chief complaint. Physician 2, a moonlighter in the ED, assesses patient 2 and inadvertently enters patient 1’s chart on the electronic charting system and orders an intravenous (IV) steroid for an asthma exacerbation. Physician 2 is working in multiple, physically separate areas in the ED and leaves this section to care for other patients. Nurse 2 (caring for patient 2) is called to assist in the triage area and does not inform nurse 1 of patient 2’s condition, as she thinks she will only be gone a few minutes. Nurse 1 signs off the IV medication order (intended for patient 2) and administers it to patient 1. Patient 1’s caregiver asks what medicine she is giving and why. Nurse 1 states, “It is for her difficulty breathing” and does not question further. Physician 2 signs out patient 2 to physician 3, after admitting the patient to the hospital, reporting that patient 2 received the IV medication several hours prior. Patient 2 decompensates on the inpatient unit in the next 6 hours, requiring more frequent and aggressive asthma treatment. Patient 1 received an unnecessary medication for the ultimate diagnosis of diabetic ketoacidosis, although there was no harm attributed to this error.

Failures of teamwork and communication are commonly cited as etiological contributions in root cause analyses of medical errors and sentinel adverse medical events. The previously mentioned case illustrates multiple breakdowns in communication—both verbal and written—and several failures of collaborative teamwork as demonstrated by members working in their isolated domains in the ED. The environment of delivering health care in the PED is highly complex and plagued by many difficulties that could potentially be helped by working more effectively in teams and on improving communication patterns. After completing this CME activity, pediatric emergency department physicians should be better able to evaluate characteristics of the emergency department environment, which make it vulnerable to medical errors and adverse events, illustrate the concept of a medical team and components of effective teams, distinguish effective types of communication patterns one might use in the PED, assess components of Crew Resource Management training, and examine the existing scientific evidence that teamwork and improved communication patterns may improve patient safety in the emergency department.

WHAT MAKES THE ED SUCH A VULNERABLE ENVIRONMENT?

The environment in which the emergency practitioner cares for patients is laden with barriers to concise communication and patient safety. On the other hand, many of these barriers and vulnerabilities, unique to the practice of emergency medicine, also lend themselves almost naturally to the principles of collaborative teamwork. For these reasons, the concepts of medical teams and effective communication are ideal for the ED setting.

Table 1 lists some characteristics of clinical care and operations that render the ED vulnerable to potential medical
TABLE 1. Characteristics of Clinical Care and Department Operations Making the ED Vulnerable to Medical Errors

<table>
<thead>
<tr>
<th>Characteristic</th>
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<tr>
<td>Dynamic in patient load, patient acuity, staffing, and operational resources</td>
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<tr>
<td>High acuity</td>
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<tr>
<td>High volume (overcrowding)</td>
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<tr>
<td>High velocity/fast paced</td>
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<tr>
<td>Multiple interruptions</td>
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<tr>
<td>No boundaries: infinitely expandable, no control over volume/workload</td>
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<tr>
<td>Uncertainty (lack of information/incomplete information)</td>
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<tr>
<td>Certainty bias</td>
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<tr>
<td>Time constrained</td>
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<tr>
<td>Multiplicity/multitasking (shift and reset cognitive frame)</td>
</tr>
<tr>
<td>Discontinuous care (shift work, transient population)</td>
</tr>
<tr>
<td>Fluctuating care (high volume/low acuity, low volume/high acuity)</td>
</tr>
<tr>
<td>Little opportunities for feedback or opportunity to learn from experience</td>
</tr>
<tr>
<td>Not a clinical skill practice environment</td>
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Interruptions pose a particular obstacle to efficient and safe patient care in the ED. One set of Australian studies quantified ED interruption rates (for all clinical workers) at 11.2 to 14.8 per person hour.\(^1,2\) Another study sought to compare interruption rates between ED physicians and office-based primary care physicians. They found that, on average, ED physicians were interrupted 9.7 times per hour, compared with 3.9 times for their outpatient counterparts.\(^3\)

Another difficulty facing the ED practitioner is a mode of thinking that has been coined certainty bias, that is, the tendency to formulate plans with preliminary or incomplete data to package the patient and move on to the next task.\(^4\) Physicians may feel additional pressure to have succinct plans of care for patients presently in the ED. Having a common approach is particularly important if patient characteristics with the multitasking and time limitations that are commonplace for emergency practitioners, and one can easily see why principles of teamwork may be best applied in the ED. Physicians and nurses must constantly shift and reset their cognitive frame and communicative approaches as multiple variable clinical situations dictate. This characteristic may contribute significantly to human errors, which are inevitable. Thus, system changes must be in place to minimize these risky situations.

Interrupts also are an important part of medical team functioning. They represent the ‘‘time’’ aspect of the core element of all teams—time.\(^5,6\) Activities by teams in the ED is most often cited as patient safety, but teamwork skills and mutual accountability.\(^7\) The primary goal of medical teams in the ED is most often cited as patient safety, but teamwork should also be focused on more effective and efficient patient care. Specific performance improvement goals can be long-term (eg, reduced incidence of mislabeled laboratory specimens) or immediate (such as listing priorities in caring for a group of patients presently in the ED). Having a common approach is often encompassed in team training, which will be discussed. The attribute of complementary skills is a familiar characteristic in our intrinsically multidisciplinary practice of medicine.

**WHAT IS AN ED TEAM?**

Increasing awareness of varied and multiple issues surrounding patient safety mandates that health care organizations devise means to address these critical concerns. One of the methods of recent interest is the implementation of medical teams. In today’s health care system, almost all care is delivered by multidisciplinary teams of providers. Teamwork skills have significant potential to prevent and mitigate medical errors in the ED setting. In theory, teamwork behaviors have value in halting the Swiss cheese model of holes leading to chains of errors. Both the Institute of Medicine and the National Quality Forum have heralded medical team training as a necessary tool for patient safety.\(^7,8\) However, the scientific evidence to support these recommendations is only beginning to emerge.

At first glance, ED clinicians may assume that they already work within a medical team. However, most are accustomed to clinical work within a group, which is defined as a collection of people who work alongside one another. A team can be described as “a small number of people with complementary skills who are committed to a common purpose, shared performance goals, and a given approach who hold themselves mutually accountable.”\(^9\) Most individuals in health care affirm concepts of teams and teamwork but lack both a firm understanding of what a medical team is. Fortunately, many of the skills necessary for teams already exist for most ED clinicians. What remains is the training and the management to hone these abilities and to make one’s thinking about teamwork more precise.

Effective teams are characterized by a meaningful purpose, specific performance goals, a common approach, complementary skills, and mutual accountability.\(^7\) The primary goal of medical teams in the ED is most often cited as patient safety, but teamwork should also be focused on more effective and efficient patient care. Specific performance improvement goals can be long-term (eg, reduced incidence of mislabeled laboratory specimens) or immediate (such as listing priorities in caring for a group of patients presently in the ED). Having a common approach is often encompassed in team training, which will be discussed. The attribute of complementary skills is a familiar characteristic in our intrinsically multidisciplinary practice of medicine.

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team member, and the goals at hand. This is referred to as situational awareness. Two simple strategies to optimize situational awareness are commonly used. An informal means is represented by the acronym STEP. This is a tool to trigger awareness for and individual or a group regarding the status of the patient, team members (monitoring others' stress, fatigue, and performance), environment, and progress toward the goal. The US Department of Defense’s Patient Safety Program, in collaboration with the Agency for Healthcare Research and Quality (AHRQ), has developed and implemented TeamSTEPPS: Team Strategies and Tools to Enhance Performance and Patient Safety, which is an evidence-based teamwork system to improve communication and teamwork skills among health care professionals with the goal of improving patient safety. A more detailed explanation of the curriculum and training materials can be found on the Web site http://teamstepps.ahrq.gov/. The TeamSTEPPS triangle logo (Fig. 1) is a visual representation of some basic but critical concepts related to teamwork training: leadership, communication, situation monitoring, and mutual support. Research with this training curriculum has demonstrated that if a team has tools and strategies, it can enhance performance, knowledge, and attitudes. For example, if every member of the team has basic competency in situation monitoring and communication, it is incumbent upon them to build shared mental models more effectively. Improved outcomes beget greater proficiency (improved teamwork skills) and a desire to be a part of the team (attitudes). Such is the reciprocal relationship between skills and outcomes.

More formally, team meetings allow opportunities to enhance awareness. These come in the form of briefings (beforehand), debriefings, and ad hoc meetings in the midst of patient care, also known as team huddles. These impromptu discussions enhance awareness. Two simple strategies to optimize situational awareness are commonly used. An informal means is represented by the acronym STEP. This is a tool to trigger awareness for and individual or a group regarding the status of the patient, team members (monitoring others' stress, fatigue, and performance), environment, and progress toward the goal. The US Department of Defense’s Patient Safety Program, in collaboration with the Agency for Healthcare Research and Quality (AHRQ), has developed and implemented TeamSTEPPS: Team Strategies and Tools to Enhance Performance and Patient Safety, which is an evidence-based teamwork system to improve communication and teamwork skills among health care professionals with the goal of improving patient safety. A more detailed explanation of the curriculum and training materials can be found on the Web site http://teamstepps.ahrq.gov/. The TeamSTEPPS triangle logo (Fig. 1) is a visual representation of some basic but critical concepts related to teamwork training: leadership, communication, situation monitoring, and mutual support. Research with this training curriculum has demonstrated that if a team has tools and strategies, it can enhance performance, knowledge, and attitudes. For example, if every member of the team has basic competency in situation monitoring and communication, it is incumbent upon them to build shared mental models more effectively. Improved outcomes beget greater proficiency (improved teamwork skills) and a desire to be a part of the team (attitudes). Such is the reciprocal relationship between skills and outcomes.

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Common hindrances to team implementation deserve mentioning. These include biases toward individualism in patient care, personalities or attitudes that do not lend to teamwork, weak organizational ethics, and having too many members (which can lead to less individual responsibility). Further obstacles related to communication are addressed in the following section. Awareness of these barriers will allow team members to better recognize and seek solutions for them.

COMMUNICATION IN THE ED

Communication failures have been implicated as the root cause of greater than 60% of sentinel events reported to the Joint Commission on Accreditation of Healthcare Organizations. Breakdowns in communication lead to most of the adverse events in studies from EDs and other clinical settings. Most errors linked to communication failures, however, have been shown to be preventable. Moreover, it is necessary to recognize the crucial role of communication within and between clinical teams for safe clinical practices and effective organizational performance.

Emergency medicine is primarily a communicative health care specialty. Communication in the ED can be direct or indirect: verbal, handwritten, electronic, represented by colors or flashing numbers, a foreign language, or general overhead announcements, to name a few. The complexity already becomes evident. Through a qualitative study of 2 academic EDs, Eisenberg et al identified 4 routine communication processes that were felt to be crucial in determining the direction and quality of care, and in some scenarios, the likelihood of adverse events:

1. triage
2. testing and evaluation
3. handoffs
4. admitting.

Communication vulnerabilities in these 4 processes are outlined, and process changes are proposed to address them. This article is an excellent resource for understanding communication issues in the emergency health care setting and how they can shape and change practice and policy.

Improving communication in health care settings requires more than simply a commitment to change and a desire to improve patient safety. Systems of communication, standardized ways of relaying critical information, are being increasingly embraced by organizations that strive for optimized outcomes. Learning these communication scripts often comes in the setting of team training. This section will briefly present a few of these communication strategies.

No matter which communication tool is used, certain qualities are common to each (Table 2). One of the themes emphasized is that of closed-loop communication, meaning that all team members are aware of the critical information presented. Read-backs of data such as critical laboratory values or medication dosing is one way of ensuring that the information conveyed is received and understood.

Another important tenet of communication strategies is that any team member is empowered to question a decision as it relates to patient safety or care. Authority gradients in the workplace often stand in the way of this critical element of communication. Authority gradients refer to negative influences from authoritative figures that often hold sway over others. In health care, this can play out between attending physicians and trainees, trainees and medical students, physicians and nurses/therapists/pharmacists/etc, administrators and physicians, or even between physicians of different disciplines or subspecialties. Authority is an inherent and necessary element in any workplace, as those with the most knowledge and experience should be followed and respected. However, these gradients often translate into reluctance for workers such as trainees to voice their concerns vis-à-vis patient safety, as evidenced in several studies. Adopting standardized communication strategies helps put all team members on a level playing field while they work together to keep patients safe.
TABLE 2. Selected Communication Tools for the ED

Closed-loop communication: all team members are aware
Read-backs
Eliminate hierarchical authority gradients
SBAR:
  Situation
  Background
  Assessment
  Recommendation
DESC:
  Describe the situation
  Express your specific concerns
  Suggest other alternatives (if possible)
  Consequences of the current course should be stated
Team debriefing
Two-challenge rule
Cross-monitoring
Standardize handoffs to other emergency physicians and admitting physicians
Electronic charting and ordering
Department-wide communication systems

One of the most widely implemented frameworks for communicating critical information is represented by the acronym SBAR. In this approach, information is relayed in the following format:
- Situation: What is going on with the patient?
- Background: What is the clinical context?
- Assessment: What do I think the problem is?
- Recommendation: What do I think should be done?

When an individual senses a particular concern for patient safety, a tactic termed the DESC script can be used:
- Describe the situation.
- Express your specific concerns.
- Suggest other alternatives (if possible).
- Consequences of the current course should be stated.

Some more general means of expressing individual apprehension have been suggested. When a worker needs to make an assertive (yet nonthreatening) statement to get a colleague's attention, it is recommended that one use language such as “I am concerned,” “I am uncomfortable,” or “This is a safety issue.”

In reality, any language may be used to relay concern: the central theme is that all team members adopt a uniform manner of expressing unease that will be recognized by all (known as a communication trigger). If the statement is met with no response, the inquirer can either request additional information or communicate concerns to an individual higher up on a pre-established chain of command. This strategy, known as the 2-challenge rule, has been used for decades in industry and is being adopted more and more in health care settings as issues of patient safety and communication are brought to the forefront.

One element of communication in the ED that deserves special mention is that of patient handoffs. These transitions of patient responsibility introduce discontinuity and the potential for errors. It is likely that handoffs occur more often in the ED than in any other hospital setting. Flawed information is the primary failure in handoffs. For this reason, the Joint Commission on Accreditation of Healthcare Organizations made standardized handoffs one of its National Patient Safety Goals for hospitals in 2006. Standardizing the format and the content of patient handoffs encompasses a spectrum. Teams can adopt universal approaches to these verbal exchanges (eg, relaying the most important information first) or use rigid lists or computerized sign-out forms. The dynamic and fast-paced ED milieu is probably less well suited for these kinds of templates.

Simple strategies have been suggested to optimize handoffs in the ED. First, basic awareness of the vulnerability of the handoff can lead to optimized patient care. In this way, handoffs can be viewed as opportunities for rescue and recovery when situations are unclear or a practitioner's thinking is incomplete. Recognizing barriers to effective communication at the time of handoffs, such as environmental distractions or interruptions, is crucial to enhancing the process.

One consideration is to transition care in a separate, protected area where noise is limited but where coworkers may reach physicians should an urgent need arise. Some EDs use shift overlap periods when the oncoming physician can familiarize him/herself with the issues at hand, whereas the off-going clinician can focus on tying loose ends.

Others have recommended that handoffs occur with the immediate care team in the presence of patients and families; this type of open performance allows for participation of all team members and opportunities to correct flawed or incomplete information as needed.

WHAT CAN EMERGENCY MEDICINE LEARN FROM AVIATION ABOUT TEAMS AND COMMUNICATION? LESSONS FROM CRM

Aviation research in the last 20 years has demonstrated that effective teamwork and communication is essential to flight safety. Emergency medicine and many other health care specialties (eg, anesthesia and surgery) have much in common with aviation, specifically, the complexity and the risk of the working environment and health care provided. Both the Institute of Medicine and the AHRQ have suggested that patient safety can be enhanced by implementing principles of aviation CRM into our health care environment. This term originated about 30 years ago when NASA convened a workshop that comprised experts from industry, government, and academia for the purpose of developing solutions to numerous high-profile commercial airline accidents.

Crew resource management emphasizes 6 key areas: managing fatigue, creating and managing teams, recognizing adverse situations, cross-checking and communication, developing and applying shared mental models for decision making, and giving and receiving performance feedback. Crew resource management training teaches explicit behavior strategies that use all of the expertise and the abilities embodied in the crew, which easily lends itself to the smooth functioning of an ED. An essential principle of CRM is that a team needs to be formally established for teamwork behaviors to be effective. The ultimate goal of CRM is to improve safety through improving operational reliability and to reduce the risk of error by using all resources at hand.

Crew resource management is not only a required training program for all commercial airlines but also an operational philosophy for multircrew cockpits, the latter having direct applicability to the practice of emergency medicine. Training topics are divided into communications processes, decision behavior, and team building and maintenance. In addition, although the Federal Aviation Administration mandates CRM training, it does allow flexibility and customization of training programs within individual airlines, another important concept when applying these principles to health care—one size does not fit all. Finally, CRM is not a single safety intervention skill, but it requires ongoing training, evaluation, and feedback. It must be integrated into the daily activities of health care delivery to be sustainably successful.

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There is growing evidence that CRM principles may improve safety in the ED setting, as many independent emergency medicine organizations and hospitals are developing and/or adapting CRM-like programs and curricula for their employees. One example is the Emergency Team Coordination Course (Dynamics Research Corporation, Andover, Mass), a precursor to the larger MedTeams project, which will be discussed in greater detail later. The course is arranged around 5 team dimensions: maintain team structure and climate, apply problem-solving strategies, communicate with the team, execute plans and manage workload, and improve team skills. Initial studies of this curriculum demonstrated improved team behaviors in hospital EDs, reduction of clinical errors, and improved staff attitudes toward team work.\textsuperscript{21,22} Another study published in 2004 demonstrated that CRM-based safety training for selected clinical and administrative departments at a large academic institution (including the ED) resulted in improvement of attitudes toward all 6 components of CRM and agreement that it would improve patient safety and reduce errors.\textsuperscript{23} These attitude changes certainly represent an initial step toward change in the safety organizational culture.

**TEAMS AND COMMUNICATION IN THE MEDICAL LITERATURE**

Although evidence supporting teamwork and communication is accruing, these ideas remain very much in their infancy in the medical literature. Prospective studies supporting the implementation of these concepts are largely lacking. However, these principles have existed in organizational and behavioral science for decades.

The Committee on Pediatric Emergency Medicine of the American Academy of Pediatrics published recommendations in 2007 for patient safety in the PED. This policy statement recommended that PEDs implement both structured handoffs of patient care and teamwork training to ensure a safe environment for pediatric emergency care. Important elements of team training included CRM, SBAR, the use of critical language, and using briefings and debriefings.\textsuperscript{20}

Most studies on medical teams have focused on members’ beliefs and attitudes toward team training and its effects, with responses being mostly positive.\textsuperscript{24-27} One study compared views on errors and teamwork between workers in the operating room, intensive care unit, and an airline cockpit crew. Pilots had a greater appreciation for error and its root causes, and surgeons were more likely to adhere to authority gradients within their subspecialty.\textsuperscript{28} Notably, physicians reported a higher level of teamwork than did their nursing counterparts, a finding that has been reproduced in other surveys on teamwork.\textsuperscript{29,30}

MedTeams is a large research project developed by Dynamics Research Corporation (Andover, Mass) that has developed an emergency care teamwork training product based on both CRM

<table>
<thead>
<tr>
<th><strong>TABLE 3. MedTeams Teamwork Behavior Matrix</strong></th>
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<tbody>
<tr>
<td><strong>Team Dimension</strong></td>
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<tr>
<td></td>
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<tr>
<td>Maintain team structure and climate</td>
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<td></td>
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<tr>
<td>Apply problem-solving strategies</td>
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<td>Communicate with the team</td>
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<td></td>
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<tr>
<td>Execute plans and manage workload</td>
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<tr>
<td>Improve team skills</td>
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Adapted with permission from table in Risser et al.\textsuperscript{33}
behavioral and human factor principles (http://teams.drc.com).
Initial studies in EDs report that the same CRM behaviors used by highly effective aviation teams result in effective outcomes in the ED. A more recent study of MedTeams delineated 5 constructs and behaviors associated with the teamwork system and then, in a retrospective study, determined the percentage of malpractice cases in which these teamwork failure constructs contributed to clinical errors (Table 3). The single teamwork failure most frequently cited as a primary contributor to the occurrence of clinical error was cross-monitoring (35% of cases). Cross-monitoring is a process of observing the actions of other team members for the purpose of sharing the workload and reducing errors. It serves as a means of watching each other's back so that oversights are caught quickly and easily. The authors also concluded through their analyses that better teamwork could save nearly $3.50 per ED patient visit and could reduce litigation risk. The recent literature on communication in the health care setting has focused on patient handoffs. Omitted information and faulty communication processes were identified as the root cause of most errors linked to handoffs in one study. Multiple studies have demonstrated some reduction in errors and improved patient care with standardized and/or computerized handoff systems. There have been no studies specifically looking at handoffs in the ED setting. Strategies to improve handoffs (shift overlap, open performance) should be formally studied.

Very little literature exists on teams and communication in the PE. A 2009 survey of patient safety practices within the Pediatric Emergency Care Applied Research Network revealed that formal teams were used in 38% of centers surveyed. Bedside handoffs occurred in 24%. Most respondents endorsed a sense of safety in their ED; one of the factors most significantly associated with a safe climate was the presence of an official safety committee.

CONCLUSIONS
The complexities of emergent clinical care and operations of the ED necessitate teamwork strategies, including effective communication principles, on all levels. Evidence is emerging that implementation of these strategies is effective in reducing errors, improving patient safety, and improving health care worker attitudes. Applying principles of teamwork and communication behaviors requires a multidisciplinary approach with strong organizational leadership and support. Prioritization of which strategies or efforts to develop and implement should be decided in accordance with individual environments after careful examination of errors and adverse events that have occurred, concerns expressed by employees about patient safety issues, and the ED’s organizational performance goals. There exists a clear need for prospective, controlled studies of the effects of formal teams in pediatric emergency care. In addition, issues pertaining to communication, especially handoffs, in emergency medicine need to be explored.

After completing this CME activity, pediatric emergency department physicians should be better able to evaluate characteristics of the emergency department environment, which make it vulnerable to medical errors and adverse events, illustrate the concept of a medical team and components of effective teams, distinguish effective types of communication patterns, assess components of Crew Resource Management training, and examine the existing scientific evidence that teamwork and improved communication patterns may improve patient safety in the emergency department.

REFERENCES


CME EXAMINATION
December 2010

Please mark your answers on the ANSWER SHEET.

Enhancing Patient Safety in the Pediatric Emergency Department, Pruitt and Liebelt.

1. What is an important component of crew resource management?
   A. Working extra shifts to help other crew members
   B. Using all the resources at hand
   C. Making important decisions by yourself
   D. Not asking the crew for help

2. Effective teams are characterized by:
   A. Specific performance goals
   B. Complementary skills
   C. Mutual accountability
   D. All of the above

3. What is a characteristic of an emergency health care setting that makes it vulnerable to medical errors?
   A. Predictable patient population
   B. Continuity of care
   C. Bounded by patient diversion laws
   D. Multitasking of health care providers

4. Empowering all members of the health care team to speak up and question a decision or care eliminates:
   A. SBAR communication
   B. Authority gradients
   C. Need for patient handoffs
   D. Decision making for individuals

5. Exiting published evidence has demonstrated all of the following EXCEPT:
   A. Standardized handoff systems reduce medical errors
   B. Nurses perceive higher levels of teamwork than do their physician counterparts
   C. Implementing teamwork strategies in the ED may lead to reduced litigation
   D. Common root causes for medical errors include lack of cross-monitoring and poor communication processes
ANSWER SHEET FOR THE PEDIATRIC EMERGENCY CARE
CME PROGRAM EXAM
December 2010

Please answer the questions on page 949 by filling in the appropriate circles on the answer sheet below. Please mark the one best answer and fill in the circle until the letter is no longer visible. To process your exam, you must also provide the following information:

Name (please print): _____________________________________________________________
Street Address __________________________________________________________________
City/State/Zip _____________________________________________________________________
Daytime Phone _____________________________________________________________________
Specialty __________________________________________________________________________

1. A B C D E
2. A B C D E
3. A B C D E
4. A B C D E
5. A B C D E

Your evaluation of this CME activity will help guide future planning. Please respond to the following questions below.

Please rate these activities (1 – minimally, 5 – completely) 1 2 3 4 5
These activities were effective in meeting the educational objectives 0 0 0 0 0
These activities were appropriately evidence-based 0 0 0 0 0
These activities were relevant to my practice 0 0 0 0 0

How many of your patients are likely to be impacted by what you learned from these activities?
0 <20% 1 20%–40% 2 40%–60% 3 60%–80% 4 >80%

Do you expect that these activities will help you improve your skill or judgment within the next 6 months? (1 – definitely will not change, 5 – definitely will change) 1 2 3 4 5

How will you apply what you learned from these activities (mark all that apply):
In diagnosing patients 0
In monitoring patients 0
In educating students and colleagues 0
As part of a quality or performance improvement project 0
For maintenance of board certification 0
As a foundation to learn more 0
In educating patients and their caregivers 0
To confirm current practice 0
For maintenance of licensure 0

How committed are you to applying these activities to your practice in the ways you indicated above? (1 – minimally, 5 – completely) 1 2 3 4 5

Did you receive any bias for or against any commercial products or devices?
Yes No

If yes, please explain:

How long did it take you to complete these activities? ________ hours ________ minutes

What are your biggest clinical challenges related to pediatric emergency care?

[ ] Yes! I am interested in receiving future CME programs from Lippincott CME Institute! (Please place a check mark in the box)
CME EXAM ANSWERS
Answers for the Pediatric Emergency Care CME Program Exam

Below you will find the answers to the examination covering the review article in the September 2010 issue. All participants whose examinations were received by November 15, 2010 and who achieved a score of 80% or greater will receive a certificate from Lippincott CME Institute, Inc.

EXAM ANSWERS
September 2010

1. C
2. C
3. D
4. A
5. C
Error, stress, and teamwork in medicine and aviation: cross sectional surveys
J Bryan Sexton, Eric J Thomas, Robert L Helmreich

Abstract

Objectives: To survey operating theatre and intensive care unit staff about attitudes concerning error, stress, and teamwork and to compare these attitudes with those of airline cockpit crew.

Design: Cross sectional surveys.

Setting: Urban teaching and non-teaching hospitals in the United States, Israel, Germany, Switzerland, and Italy. Major airlines around the world.

Participants: 1033 doctors, nurses, fellows, and residents working in operating theatres and intensive care units and over 30 000 cockpit crew members (captains, first officers, and second officers).

Main outcome measures: Perceptions of error, stress, and teamwork.

Results: Pilots were least likely to deny the effects of fatigue on performance (26% vs 70% of consultant surgeons and 47% of consultant anaesthetists). Most pilots (97%) and intensive care staff (94%) rejected steep hierarchies (in which senior team members are not open to input from junior members), but only 55% of consultant surgeons rejected such hierarchies. High levels of teamwork with consultant surgeons were reported by 73% of surgical residents, 64% of consultant surgeons, 39% of anaesthesia consultants, 28% of surgical nurses, 25% of anaesthetic nurses, and 10% of anaesthetic residents. Only a third of staff reported that errors are handled appropriately at their hospital. A third of intensive care staff did not acknowledge that they make errors. Over half of intensive care staff reported that they find it difficult to discuss mistakes.

Conclusions: Medical staff reported that error is important but difficult to discuss and not handled well in their hospital. Barriers to discussing error are more important since medical staff seem to deny the effect of stress and fatigue on performance. Further problems include differing perceptions of teamwork among team members and reluctance of senior theatre staff to accept input from junior members.

Introduction

Population based research suggests that in the United States between 44 000 and 98 000 patients die each year from preventable errors, making medical error the eighth most common cause of death. One of the better established (yet often overlooked) findings in stress research is that as stress or arousal increases, an individual’s thought processes and breadth of attention narrow. Poor teamwork and communication have been documented during trauma resuscitation, surgical procedures, and treatment of patients in intensive care units. One systems approach to medical error has led to the development of simulators to study and improve teamwork for surgical and trauma resuscitation teams. Further research is needed to tailor such training to the specific needs of individual organisations.

The airline industry has used surveys to collect data on pilot attitudes about safety and interpersonal interactions to diagnose strengths and weaknesses and to aid in the development of interventions. Individuals’ attitudes (as opposed to personalities) are relatively malleable to training interventions and predict performance. A successful intervention called crew resource management training has been developed to address specific attitudes, change related behaviour, and improve performance of the cockpit crew. Correspondingly, attitudes about errors, teamwork, and the effect of stress and fatigue on performance could be prime targets for measurement and improvement in medicine. Surveys are an inexpensive method of data collection that points to interventions and fit well with the systems approach since they elicit (on a large scale) what caregivers actually think.

For the past 20 years, the University of Texas human factors research project has been investigating teams at work in safety critical environments such as aviation, space, maritime, and medicine. In this paper, we present recent data comparing attitudes about error, stress, and teamwork among healthcare workers and airline cockpit crew members. We also present error related perceptions of intensive care doctors and nurses. Aviation data are presented to serve as a point of reference from another safety critical domain.

The survey items presented tap into attitudes toward stress, hierarchy, teamwork, and error. Previous research has found that these items are relevant to understanding error, predictive of performance, and sensitive to training interventions. Attitudes regarding the recognition of stressor effects indicate the degree to which individuals will place themselves in error inducing conditions, and items regarding hierarchy and teamwork indicate the abilities of team members to manage both threats and errors in a team environment.

Participants and methods

We used four questionnaires to survey participants. The cockpit management attitudes questionnaire has been widely used in aviation and was developed to measure attitudes toward stress, status hierarchies,
Responses to questions on dealing with stress and teamwork according to discipline and position. Values are numbers (percentages)

<table>
<thead>
<tr>
<th>Item description</th>
<th>Anaesthetic</th>
<th>Surgical</th>
<th>Intensive care</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nurse (n=162)</td>
<td>Resident (n=60)</td>
<td>Consultant (n=104)</td>
</tr>
<tr>
<td>Even when fatigued, I perform effectively during critical phases of operations/patient care</td>
<td>Agree 89 (55)</td>
<td>34 (57)</td>
<td>49 (47) 105 (60)</td>
</tr>
<tr>
<td></td>
<td>Neutral 36 (22)</td>
<td>6 (10)</td>
<td>16 (15)</td>
</tr>
<tr>
<td></td>
<td>Disagree 37 (23)</td>
<td>20 (33)</td>
<td>39 (38)</td>
</tr>
<tr>
<td>A truly professional team member can leave personal problems behind when working in the operating room/intensive care unit</td>
<td>Agree 96 (59)</td>
<td>33 (55)</td>
<td>55 (53)</td>
</tr>
<tr>
<td></td>
<td>Neutral 24 (15)</td>
<td>8 (13)</td>
<td>10 (10)</td>
</tr>
<tr>
<td></td>
<td>Disagree 42 (26)</td>
<td>19 (32)</td>
<td>38 (37)</td>
</tr>
<tr>
<td>My decision making ability is as good in medical emergencies as in routine situations</td>
<td>Agree 91 (56)</td>
<td>37 (61)</td>
<td>70 (67)</td>
</tr>
<tr>
<td></td>
<td>Neutral 49 (30)</td>
<td>10 (17)</td>
<td>10 (10)</td>
</tr>
<tr>
<td></td>
<td>Disagree 23 (14)</td>
<td>13 (22)</td>
<td>24 (23)</td>
</tr>
</tbody>
</table>

Junior team members should not question the decisions made by senior team members

| Item description                                                                 | Agree 21 (13) | 9 (15) | 17 (16) | 24 (14) | 11 (21) | 40 (24) | 2 (2) | 1 (3) | 151 (2) |
|                                                                                   | Neutral 27 (17) | 8 (13) | 10 (10) | 30 (17) | 11 (21) | 35 (21) | 4 (4) | 1 (3) | 76 (1) |
|                                                                                   | Disagree 113 (70) | 43 (72) | 87 (84) | 121 (69) | 30 (58) | 92 (55) | 102 (84) | 28 (94) | 7331 (97) |

leadership, and interpersonal interaction issues. The questionnaire is reliable, sensitive to change, and the elicited attitudes have been shown to predict performance. A subsequent version, the flight management attitudes questionnaire was developed to broaden the perspective of the instrument to include the effect of organisational climate and national culture on safety.

Two medical surveys have also been developed as part of an extension of human factors research into medical environments: the operating room management attitudes questionnaire and the intensive care management attitudes questionnaire, which is reported here for the first time. All the questionnaires contained a core set of 23 items from the cockpit management attitudes questionnaire with minor modification of wording to match the work environment—for example, “Junior cockpit crew members should not question the decisions made by senior cockpit crew members” was changed to “Junior operating room team members should not question the decisions made by senior team members.” These core items allow comparisons to be made over time, across different organisations, across positions within an organisation (such as nurses and doctors), and between disciplines. We report here results of the core items as well as a set of error related items specific to the intensive care questionnaire.

All surveys were administered through hospital or airline internal mail (with parallel covering letters). Respondents were given the option of returning their questionnaires in an anonymous drop box or a stamped envelope addressed to our laboratory in Austin, Texas. In each administration, the survey content was essentially the same.

The core items have been administered to cockpit crew members (captains and first and second officers) from 40 different airlines in 25 countries over 15 years (with the flight management attitudes questionnaire used in the past seven years). The operating room questionnaire was completed by theatre staff (surgical and anaesthetic consultants, nurses, and residents) from 12 urban teaching and non-teaching hospitals in Italy, Germany, Switzerland, Israel, and the United States in the past three years. The intensive care data are from staff in one large urban teaching hospital in the United States. The respondents were intensive care physicians (adult and child pulmonary physicians, cardiologists, and neonatologists) and nurses (registered nurses, licensed vocational nurses).

**Statistical analysis**

Data from each of the surveys were merged into a combined database of operating theatre, intensive care, and flight crews. Data from each of the staff positions were collapsed across all hospitals with representative samples. We excluded two hospitals from the analyses because they did not provide representative samples. We have presented descriptive data, as the sample size is not large enough for multilevel modelling.

**Results**

The flight management questionnaire and cockpit management questionnaire were returned by over 30 000 pilots, with response rates ranging from 15% to over 90% (average 45%). The operating room questionnaire was returned by 851 staff (response rate 40% to 100%) and the intensive care questionnaire by 182 staff (response rate 50%). In an effort to make the medical and aviation samples roughly equivalent, pilot data from Latin America and Asia, which were not sampled in medicine, were not included.

**Perceptions of stress and fatigue**

In response to the item, “Even when fatigued, I perform effectively during critical times,” 60% of all medical respondents agreed, ranging from 70% among consultant surgeons to 47% among consultant anaesthetists (table). The rate of agreement was much higher in medicine than in aviation (26% of pilots agreed). As there were no differences between captains, first officers, and second officers the data are not presented separately.

Sixty seven per cent of respondents believed that true professionals can leave personal problems behind when working. Pilots and anaesthesia consultants, residents, and nurses were less likely to deny the effects of
personal problems (53%-59%) than surgical consultants (82%). In response to the item, “My decision-making ability is as good in medical emergencies as in routine situations,” 70% of all medical respondents agreed. Among theatre staff, consultant surgeons were the most likely to agree with this statement, and intensive care staff were more likely to agree than surgeons (table). In general, only a minority of respondents openly recognised the effects of stress on performance.

**Attitudes to teamwork and hierarchy**

Seventy per cent of respondents did not agree that junior team members should not question the decisions made by senior team members, but there were differences with position and discipline (table). Consultant surgeons were least likely to advocate flat hierarchies (55%). By contrast, 94% of cockpit and intensive care staff advocated flat hierarchies.

Over 80% of all medical staff reported that preoperative and postoperative discussions (for intensive care staff before and after ward rounds) are an important part of safety and teamwork. A quarter indicated that they are not encouraged to report safety concerns, and only a third said that errors are handled appropriately in their hospital.

**Differing perspectives of teamwork in medicine**

The different perspectives on teamwork among medical staff were shown by the responses to the item “Rate the quality of teamwork and communication or cooperation with consultant surgeons” (fig 1). In particular, surgical consultants and residents rated teamwork they experienced with other consultant surgeons the highest (64% (29/45) and 73% (40-55) reported high levels of teamwork; 7% (8/45) and 9% (5/55) reported low levels), while anaesthesia residents, anaesthesia nurses, and surgical nurses rated interactions with consultant surgeons lowest (10% (8/77), 26% (36/141), and 28% (35/124) reported high levels of teamwork; 39% (48/124), 43% (33/77), and 48% (67/141) reported low levels). At the aggregate level, 62% (146/135) of surgical staff rated teamwork with anaesthesia staff highly, and 41% (106/250) of anaesthesia staff rated teamwork with surgical staff highly. In other words, surgery generally reports good teamwork with anaesthesia, but anaesthesia staff do not necessarily hold a reciprocal perception.

Differences between doctors and nurses were found regarding the quality of teamwork in intensive care. Although 77% of intensive care doctors reported high levels of teamwork with nurses, only 40% of nurses reported high levels of teamwork with doctors.

**Attitudes about error and safety**

Over 94% of intensive care staff disagreed with the statement “Errors committed during patient management are not important, as long as the patient improves.” A further 90% believed that “a confidential reporting system that documents medical errors is important for patient safety.” Over 80% of intensive care staff reported that the culture in their unit makes it easy to ask questions when there is something they don’t understand (this is undoubtedly related to the high endorsement of flat hierarchies in the unit). One out of three intensive care respondents did not acknowledge that they make errors. Over half report that decision making should include more team member input.

More than half of the respondents reported that they find it difficult to discuss mistakes, and several barriers to discussing error were acknowledged. The 182 staff in intensive care reported that many errors are neither acknowledged nor discussed because of personal reputation (76%), the threat of malpractice suits (71%), high expectations of the patients’ family or society (68%), possible disciplinary actions by licensing boards (64%), threat to job security (63%), and expectations or egos of other team members (61% and 60%). The most common recommendation for improving patient safety in the intensive care unit was to acquire more staff to handle the present workload, whereas the most common recommendation in the operating theatre was to improve communication.

**Discussion**

Historically, medical and aviation workers have been expected to function without error. In aviation, perceptions of fatigue, stress, and error continue to be topics of training and targets for improvement. Much progress has been made to create a culture in aviation that deals effectively with error, whereas in medicine substantial pressures still exist to cover up mistakes, thereby overlooking opportunities for improvement. We found that susceptibility to error is not universally acknowledged by medical staff, and many report that error is not handled appropriately in their hospital.

Medical staff also play down the effects of stress and fatigue. The denial of stress and its effects on performance may help individuals adapt to medical school and residency, but a healthy recognition of stressor effects reduces the likelihood of error and increases the use of threat and error management strategies. For instance, tired pilots who acknowledge their own limitations manage their fatigue by saying that they are tired, asking other crew members to keep an eye on them, increasing caffeine intake, and reallocating workload as necessary during the flight. Many tragedies, such as flying accidents, military defeats, and recent incidents on the space station MIR, are linked to the failure of individuals to perform appropriately well rehearsed actions under stress. Research in aviation
shows that individuals can be trained to recognise stress as an error inducer—for example, by crew resource management training—and continue to improve with recurrent training.

**Measuring teamwork attitudes and behaviour**

Ratings of teamwork and communication differed substantially among groups of respondents. The perception of poor teamwork by one team member, whether actual or perceived, is enough to change the dynamics within that team, causing that team member to withdraw. Preliminary data from behavioural observations of teamwork by trained observers of operating theatre teams suggest that these attitudes are representative of behaviour (particularly with respect to teamwork between surgical and anaesthetic staff; fig 2).

Future research should investigate teamwork in medicine, and its relationship to error rates and error severity. In addition to being an error-management technique, effective teamwork and communication also has several positive side effects, such as fewer and shorter delays, and increases in morale, job satisfaction, and efficiency. Behaviour was observed in 3204 commercial flights, from before departure to landing, and in 96 randomly selected surgical procedures from patient arrival to transfer to the recovery room. Examples of a poor rating would be failed communication of skin incision or removal of the aortic-cross clamp or implementation of Trendelenburg position without notifying the surgeon.

There is a relationship between perceptions of teamwork and status in the team. Surgeons are most supportive of steep hierarchies in which junior staff do not question senior staff. Surgeons also perceive teamwork and communication in the team to be of a higher quality than the rest of the team. Similarly, in intensive care, doctors rated teamwork with nurses higher than did nurses with doctors. However, future research should not focus exclusively on consultants. Indeed, our experience in aviation tells us that poor communication does not equate to an obstinate captain but to poor threat and error management at the team level. Highly effective cockpit crews use one third of their communications to discuss threats and errors in their environment, regardless of their workload, whereas poor performing teams spend about 5% of their time doing the same.

**Limitations**

The most important limitation of our study was the small sample of hospitals, and these data should therefore be considered preliminary. As more data are collected, the issues of hospital to hospital variation and non-response biases can be addressed empirically. Our research in aviation found no significant differences between cockpit crew responders and non-responders on demographic variables such as sex, years experience, background (military or civilian), and position (captain, first officer, second officer).

Survey data are limited by reliance on self reporting, are potentially biased by non-responders (little is known about non-response biases in healthcare surveys such as these), and are not the panacea for what ails a safety critical system. However, they can be used to diagnose the strengths and weaknesses of an organisation, to create data driven training interventions, and to assess the effect of training. Survey data also help to tailor training interventions to address local issues.

**Changing the professional culture in aviation**

After the introduction of jet transport in the 1950s, accident rates due to mechanical failure dropped steeply. As data on accidents accumulated, it became obvious that most accidents were related to breakdowns in crew coordination, communication, and decision making. The resulting shift toward a more open culture that accommodated questioning and recognised human limitations was a gradual but steady progression.

The change came about through the involvement of the research community, National Aeronautics and Space Administration, regulatory agencies, and the use of data driven initiatives to raise awareness of the limitations of human performance and the importance of effective teamwork. For the first time there were instruments to collect reliable human factors data—a combination of individual attitudes, organisational norms, and assessments of behaviour before and after training interventions determined if change was actually taking place without having to rely on retrospective data from accident investigation. Data collection instruments such as the cockpit management attitudes questionnaire were used to show changes in safety related attitudes before and after training, and these changes mapped on to actual behaviour in the cockpit.

Selection and training processes were amended. Pilots began to be selected not only for technical skills but also their ability to coordinate activities, learn from error, and recognise that others can contribute to problem solving. Airlines initiated a new approach to training and assessing pilot skills by moving away from training the individual pilot to training the entire crew—recognising that safety and good performance was not just a function of the captain but of the captain using all available resources. The aviation approach is to deal with errors non-punitively and proactively, and this approach defines behavioural strategies taught in crew resource management training (currently in its fifth generation) as error countermeasures that are used to avoid error whenever possible, to trap errors when they do occur,
Much attention has been given to medical error in recent years. Many approaches to team training used in aviation are likely to be useful in medicine, their design and effect need to be validated to avoid haphazard approaches of limited utility. This article is dedicated to the late Dr Hans-Gerhard Schaefer, whose personal quest to find and solve the human problems at the core of medical care made a lasting impression on us. We thank Lou Montgomery and Jennifer Mulhollen for help in collecting the medical data from Italy.

Contributors: JBS (guarantor) coordinated the data collection across hospitals and several of the airlines, formulated the core ideas, and participated in the analyses and writing of the paper. EJT collected data and participated in the analysis and writing. RLH has overseen most of this research since the early 1980s and contributed to the analyses and writing of the paper.

Competing interests: None declared.

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Competing interests: None declared.
Effective communication and teamwork is essential for the delivery of high quality, safe patient care. Communication failures are an extremely common cause of inadvertent patient harm. The complexity of medical care, coupled with the inherent limitations of human performance, make it critically important that clinicians have standardised communication tools, create an environment in which individuals can speak up and express concerns, and share common “critical language” to alert team members to unsafe situations. All too frequently, effective communication is situation or personality dependent. Other high reliability domains, such as commercial aviation, have shown that the adoption of standardised tools and behaviours is a very effective strategy in enhancing teamwork and reducing risk. We describe our ongoing patient safety implementation using this approach within Kaiser Permanente, a non-profit American healthcare system providing care for 8.3 million patients. We describe specific clinical experience in the application of surgical briefings, properties of high reliability perinatal care, the value of critical event training and simulation, and benefits of a standardised communication process in the care of patients transferred from hospitals to skilled nursing facilities. Additionally, lessons learned as to effective techniques in achieving cultural change, evidence of improving the quality of the work environment, practice transfer strategies, critical success factors, and the evolving methods of demonstrating the benefit of such work are described.

Communication failures are the leading causes of inadvertent patient harm. Although medical care is delivered by multiple team members, medical quality and safety has historically been structured on the performance of expert, individual practitioners. Effective communication and teamwork have been assumed, and formal training and assessment in these areas has been largely absent. Appreciation that the clinical care environment has become progressively more complex, combined with the inherent limitations of human performance, has spurred interest in applying the lessons of other high reliability industries to medicine.

The development and implementation of crew resource management (CRM) in aviation over the last 25 years offers valuable lessons for medical care. Realising that 70% of commercial flight accidents stemmed from communication failures among crew members, CRM sought to standardise communication and teamwork. Currently, CRM is required globally in aviation training, and direct observational studies by Robert Helmreich’s group have correlated actual flight crew performance with attitudes toward teamwork and safety. In 2000, we undertook the adoption of relevant behaviours and skills into high risk medical environments. Twelve clinical teams underwent a three day training programme in human factors; learning about the human factors experience in aviation, and the application of standard tools and behaviours to improve safety and ensure effective communication. The teams each worked on a clinical project in which these techniques could be applied to improve the quality and safety of patient care. The clinical domains represented varied widely from the operating room, the intensive care unit, and continuing care (the transfer of patients from hospitals to skilled nursing facilities), to obstetrics and a cardiac treadmill unit.

After the initial training, the clinical teams were supported with site visits and educational sessions for leadership and clinicians within the facilities. Cultural surveys with regard to safety were carried out using the Safety Attitude Questionnaire (SAQ). Valuable insights into the climate in these care areas with regard to teamwork, communication, and attitudes toward safety were obtained. Gathering intimate knowledge of the specific culture allowed interventions that focused on the strengths of the team and targeted opportunities for improvement. Monthly conference calls helped create a collaborative community dedicated to improving safety, and to sharing successes and approaches to the inevitable barriers.

Our experience has reinforced the belief that simple rules are best for managing complex environments. The tools and concepts that have proven the most valuable are collectively known as SBAR (situation, background, assessment, recommendation): a situational briefing model, appropriate assertion, critical language, and awareness and education regarding the fact that nurses, physicians, and other clinicians are taught to communicate in very different styles.

**Abbreviations:** CRM, crew resource management; OR, operating room; PIC, preferred intensity of care; SAQ, Safety Attitude Questionnaire
We will discuss these tools and our experiences in optimising successful implementation, and describe experiences in specific clinical areas. Other valuable concepts such as situational awareness and debriefing will be mentioned.

THE CASE FOR A PRIMARY FOCUS ON EFFECTIVE TEAMWORK AND COMMUNICATION

Communication failures are the leading cause of inadvertent patient harm. Analysis of 2455 sentinel events reported to the Joint Commission for Hospital Accreditation revealed that the primary root cause in over 70% was communication failure. Reflecting the seriousness of these occurrences, approximately 75% of these patients died.\(^1\) All too often, clinicians providing care had very divergent perceptions of what was supposed to happen. Effective communication and teamwork is aimed at creating a common mental model, or “getting everyone in the same movie”. Equally important is creating an environment that feels “safe” to team members so they will speak up when they have safety concerns. The mantra of “everyone in the same movie, and no surprises” is an effective one that is easy to teach. Clinicians understand that surprises in medicine are generally not good.

Many factors contribute to communication failures. First and foremost, doctors and nurses are trained to communicate quite differently. Nurses are taught to be very broad and narrative in their descriptions of clinical situations (“paint the big picture”), whereas physicians learn to be very concise, and get to the “headlines” quite quickly. Nurses often relate being told during their educational process that they “don’t make diagnoses”. This leads to nurses telephoning physicians and being very broad and narrative in their descriptions, with the doctors impatiently “waiting to find out what they want”. SBAR is very effective in bridging this difference in communication styles and helping to “get everyone in the same movie.”

Hierarchy, or power distance, frequently inhibits people from speaking up. Effective leaders flatten the hierarchy, create familiarity and make it feel safe to speak up and participate. Authoritarian leaders, reinforcing large authority gradients, create unnecessary risk. The lack of standardised communication and procedures in medicine increases the importance that team members invest in creating a common mental model; otherwise, there is limited ability to predict and monitor what is supposed to happen. Many of the current Joint Commission Patient Safety Standards are aimed at structuring and improving communication.\(^1\)

A large and ever present cultural barrier is the deeply embedded belief that quality of care and error free clinical performance are the result of being well trained and trying hard. In this paradigm, inevitable mistakes are viewed as episodes of personal failure, with the predictable result that these events are minimised and not openly discussed. Human factors science tells us that the inherent limitations of human memory, effects of stress and fatigue, the risks associated with distractions and interruptions, and limited ability to multitask ensure that even skilled, experienced providers will make mistakes. As such, effective communication that creates a well understood plan of care greatly reduces the chances of inevitable errors becoming consequential and injuring patients.

TOOLS AND BEHAVIOURS FOR EFFECTIVE COMMUNICATION

Briefings, although standard practice in aviation, the military, and law enforcement, have been uncommon in clinical medicine. Spending a few minutes at the beginning of a shift can get everyone at the same starting point, avoid surprises, and positively affect how the team works together. SBAR is a very effective tool that provides a common and predictable structure to the communication. It can be used in virtually any clinical domain, and has been widely applied in obstetrics, rapid response teams, ambulatory care, the ICU, cardiac arrests, and other areas.

SBAR stands for: (i) situation – what is going on with the patient?; (ii) background – what is the clinical background, or context?; (iii) assessment – what do I think the problem is?; and (iv) recommendation – what would I do to correct it?

A clinical example:

- Situation: “Dr Preston, I’m calling about Mr. Lakewood, who’s having trouble breathing.”
- Background: “He’s a 54 year old man with chronic lung disease who has been sliding downhill, and now he’s acutely worse.”
- Assessment “I don’t hear any breath sounds in his right chest. I think he has a pneumothorax.”
- Recommendation “I need you to see him right now. I think he needs a chest tube.”

Briefly and concisely, critically important pieces of information have transmitted in a predictable structure. Not only is there familiarity in how people communicate, but the SBAR structure helps develop desired critical thinking skills. The person initiating the communication knows that before they pick up the telephone that they need to provide an assessment of the problem and what they think an appropriate solution is. Their conclusion may not ultimately be the answer, but there is clearly value in defining the situation.

Appropriate assertion

Teaching people how to speak up and creating the dynamic where they will express their concerns is a key factor in safety. Frequently, the lack of a common mental model or hierarchy gets in the way. People need to state the problem politely and persistently until they get an answer (fig 1); the common practice of speaking indirectly (the “hint and hope” model) is fraught with risk. Focusing on the problem and avoiding the issue of who’s “right” and who’s “wrong” is quite important and a major success factor.

One point is worth clarification. We often ask or require nurses to provide an objective argument to convince a physician to see a patient. Given the differences in communication style between the two groups, requiring nurses to provide a concise, cogent argument as to the severity of the patient’s condition, and basing the physician’s response time on this, is fraught with hazard. A better approach, and standard practice in our perinatal safety work, is that nurses have license to say: “I need you to come now and see this

![Assertion cycle. This is a model to guide and improve assertion in the interest of patient safety.](image-url)
patient”, and the physician responds every time. The situation is not open to argument at the time that the request is made, particularly at night or at weekends; if the relationship needs to be reassessed, that can be carried out sometime in the future when people can be more objective. Making it acceptable for the nurse to say: “Something’s wrong, I’m not sure what it is, but I need you here now” is an effective mechanism to ensure safety. Coupling this with SBAR helps ensure that communication becomes progressively clearer.

In a recent study of medical emergency teams from Australia that demonstrated an in hospital cardiac arrest reduction of 65% through early intervention, the number one criterion to call for help was “a staff member is worried about the patient”.

There were also numerous objective measures of physiological distress, but the ability of someone to seek prompt and expert help because “it doesn’t feel right” is a very insightful mechanism. Gary Klein’s work in naturalistic decision making has shown that expert individuals rapidly analyse situations by pattern matching against their mental library of prior experience. Thus, a nurse at the bedside may not be able to put a concise label or description on what is clinically unfolding, but very probably knows “something is wrong, and I need your help”. Lowering the threshold to obtain help, and treating the request respectfully and legitimately creates a much safer system.

Critical language

Medicine is a hierarchical environment, in which it can be difficult for people to speak up with concerns. Additionally, power distances, lack of psychological safety, cultural norms, and uncertainty as to the plan of action further complicate the situation. The adoption of critical language, derived from the CUS programme at United Airlines, is very effective. CUS stands for “I’m concerned, I’m uncomfortable, this is unsafe, or I’m scared”, and is adopted within the culture as meaning: “we have a serious problem, stop and listen to me”. This ability to get everyone to stop and listen is essential for safe care. Critical language creates a clearly agreed upon communication model, that helps avoid the natural tendency to speak indirectly and deferentially.

Situational awareness

Situational awareness refers to the care team maintaining the “big picture” and thinking ahead to plan and discuss contingencies. This ongoing dialogue, which keeps members of the team up to date with what is happening and how they will respond if the situation changes, is a key factor in safety. The value of maintaining situational awareness has been studied in high risk neonatal cardiac surgery by Marc DeLeval and his colleagues at Great Ormond Street Hospital in London.2

Debriefing

Debriefing is the process of spending a couple of minutes after a procedure, or at the end of a day, to assess what the team did well, what were the challenges, and what they will do differently the next time. It is a great opportunity for both individual and team learning while the events are fresh. In a study of team learning in the adoption of minimally invasive cardiac surgery, debriefings were seen as one of the key success factors in the surgical team with the quickest learning curve and best clinical outcomes.3

EXAMPLES OF CLINICAL PROJECTS FOCUSING ON TEAMWORK AND COMMUNICATION

Perinatal safety

Catastrophic birth injury is rare in the experience of a single practitioner, and may be a once in a career event. However, a limited number of clinical situations (fetal distress, the need for an emergency caesarean section, shoulder dystocia, placental abruption, and massive maternal haemorrhage) account for a very high percentage of recurrent events.4 Invariably, poor outcomes are accompanied by fundamental communication failures.

One scenario that illustrates the importance of effective communication is the “myth of the low risk delivery” (Dr Eric Knox, personal communication). A healthy mother and fetus arrive in labour. If either the mother or the fetus were high risk, everyone would be aware that a potential problem exists. In the case of the low risk parturient, complacency can be very dangerous, because of the attitude of “we’ve done this thousands of times and never had a problem”. In the small percent of these labours that develop a problem, a critical juncture occurs when the nurse has to deal with a physician perceived to be unpleasant or difficult to approach. Reflecting human nature, the nurse will try to correct the problem themselves, and avoid a potentially unpleasant interaction. Most of the time this approach works, but in the case where there is now more of a problem, the next interaction is really critical. When the nurse approaches the physician for help and gets the answer “try these three things and call me in an hour”, the stage is set for a disaster.

Experience from Kaiser Permanente

Kaiser Permanente is the largest, non-profit health system in America, founded over 50 years ago. It is an integrated care model that has 135 000 employees, more than 11 000 physicians, and provides medical care for some 8.3 million patients.

In the Kaiser Permanente perinatal work, the practice has been instituted that if a nurse or midwife is concerned, she can say to the physician “I need you now” and they will attend 100% of the time. Teams have standardised the use of SBAR as the model for communication. Additional work has been carried out to define fetal wellbeing, and to have a common approach to the interpretation of fetal heart tracing and practice for emergencies.

A good example of standardising response is illustrated by the work of Michael Fox, RN.5 He has adopted a method of fetal heart rate interpretation to enable medical staff such as doctors, nurses, midwives and medical students, to use a common language to optimise the chances of problem recognition. Once fetal distress has been identified, very simple and effective rules are activated: if you see a problem, you have 1 minute to look at it by yourself; 2 minutes to look at it with someone else; and by minute three you are physically on your way to correcting the problem. These simple rules provide predictability; they remove the “grey area” of how the nurse or midwife should respond (what’s the urgency, is the doctor busy, should I call him?) – all the potential judgements that contribute to long delays in addressing fetal asphyxia. Not only is the response clear, but everyone knows the rules.

Standardised communication at shift changes has been implemented, with doctors and nurses all in the conversation, in contrast to prior practice where physicians and nurses reported to their peers separately and at different times. Briefings using SBAR are used for the team to quickly reassess the if the clinical workload increases or people are getting overloaded: “Let’s talk a minute and go over all the patients on the deck – who’s got what patient, where are we with each patient, what are the issues that need to be addressed, and how do we prioritise?”. Very quickly, the care team can ensure they are all “on the same page of the script” and all relevant clinical issues are being addressed.

Critical event training or simulation is a valuable tool. Low fidelity simulation can be carried out by physically walking through the unit and mapping all the tasks that have to be
done in the event of an emergency caesarean section: who needs to be called, what resources need to be activated (paediatrics, the nursery), and where is the equipment we will need? Midrange fidelity simulation uses a manikin simulator driven off a laptop computer. The team is challenged with various clinical scenarios and their response is videotaped for debriefing. Trust that the goal is on non-judgmental learning is critically important for credibility of the training process. Focusing on the complexity of the care process and the system flaws that set “good people up to fail” creates psychological safety, which is a key component of learning.

Patient transfer
Experience from Kaiser Fontana: benefits from the use of a checklist and briefing in patients transferred from the hospital to skilled nursing facilities
Dr Thomas Cuyegkeng and his colleagues at Kaiser Fontana undertook a process to improve the transfer of elderly patients from the hospital to skilled nursing facilities. Commonly, patients arrived at night (owing to available ambulance resources) and the breakdown in communication resulted in important medications such as anticoagulants, antibiotics, analgesics, and psychotropics being unavailable. This is a complex patient population, comprising people who are often frail and taking multiple medications. A common problem with patients arriving with incomplete information at night was that no one familiar with the patient was available to reconcile clinical issues. The Fontana team implemented two checklists; one to be completed in the hospital and one by the skilled nursing facility. This briefing was carried out nurse to nurse over the telephone with the requirement that any gaps or discrepancies be reconciled prior to 5 pm, so people familiar with the patient would be available to help. The team also recharacterised the process and changed it from a discharge to a transfer, to reinforce the requirement that any gaps or discrepancies be reconciled.

<table>
<thead>
<tr>
<th>Table 2</th>
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* n = 227; † from Fontana Hospital only (n = 71); ‡ sample of 227 patients. PIC, preferred intensity of care; abx, antibiotics; rx, therapy or medications; yf, psychotropic.

shows the improvement in providing information in both the hospital and skilled nursing facility (table 1).

Another interesting facet was that the process defined the preferred intensity of care (PIC), the conditions under which the patient or their family desired rehospitalisation and what level of care was desired. All too frequently, patients would become ill in the middle of the night or on weekends, when the skilled nursing facility staff coverage is at a minimum, and the chances of the covering physician knowing the patient are least. These chronically ill patients would be sent by ambulance to the nearest emergency department, where they would then receive extensive investigations and/or end up in the intensive care unit; exactly what the patient and their family did not want. By increasing the percentage of patients where the PIC was defined, the team estimated they were saving some 50 unwanted hospital readmissions annually across a patient population of 300 000 patients, and saving patients from being subjected to unwanted medical care.

Perioperative briefings
At Orange County Kaiser, surgical teams introduced formalised briefings into their care process. The critical success factors were clear, and there was visible physician leadership and involvement throughout, and an inclusive process that engaged people in the determination of what the briefing content should be. Developing the Orange County briefing tool involved surgeons, anaesthetists, operating room nurses and technicians, and managers, all working together. The briefing categories were broken into four sections. The surgical category began with the surgeon telling the others what he/she thought they needed to know in a given case. It was then everyone else’s turn to tell the surgeon what they needed to know. For example, the operating room (OR) nurses wanted to know if the surgeon was on call, as they would have to answer the surgeon’s pager frequently during the case; the surgeons were visibly surprised to learn how much impact this would have on the nurses during the surgery. Although these people had worked, or physically shared space, for years together, they discovered basic insights into how their behaviour or transfer of information affected others.

The briefing chart shown is the third iteration developed by the OR team (fig 2). It is a template showing the potential topics for the surgical team to cover, which they use as relevant to the case at hand. The team decided that they would brief after the patient had been anaesthetised, that being the only time they consistently have all members of the team physically present. Other facilities, believing that it is preferable to brief prior to the induction of anaesthesia, have chosen to brief in the operating room with the patient awake. The initial concern that briefing with the patient might infer that the team did not know what they were doing has not been borne out; early indications are that patients really like the process. It is presented to the patient as a last opportunity for the surgical team to make sure they are all “on the same page” and doing everything correctly.

The Orange County results have been quite positive. Wrong site surgeries, which had been a problem in the past, have not occurred since the briefing process has been initiated. Nursing turnover has fallen by 16%. As measured by the SAQ, employee satisfaction has increased by 19%, and perceptions of safety climate in the OR have gone from “good” to “outstanding”. Significant improvements were also seen in teamwork climate, communication, OR personnel taking responsibility for patient safety, and medical errors being handled appropriately. After implementation, some 80% of OR nurses reported that their input was well received by other team members. The briefing process has been
transferred within their hospital to the Departments of Radiology, and Labour and Delivery. Currently, the plan is to now begin looking at the efficiency of the OR and see how preoperative communication failures—that is, last minute surprises where the team finds out that they need particular equipment, people or skills present, are precluded by more effective communication patterns.

CRITICAL SUCCESS FACTORS

Through this experience in teamwork and communication training and clinical projects, certain critical success factors have become clear. It is essential to approach medical culture from a “bottom up” perspective. Traditional improvement efforts have been seen as “top down”—that is, “you have a problem that needs to be corrected”. This message will be immediately and vigorously rejected by the culture, which will then actively work against the desired change. A critically important element is to dissociate the inevitable errors and communication failures associated with human performance from the issue of clinical competency. Approaching improvement from the perspective of correcting system flaws and using standardised communication tools to make the day go more smoothly and keep everyone safe is effective. The message of “good people are set up to fail in bad systems”—let’s figure out how to keep everyone safe” is readily accepted. Spending time to educate clinicians about the prevalence of system error, and the inherent limitations of human performance, help dissociate error from the common perception of mistakes being episodes of personal failure.

Two absolute requirements for successful clinical change are visible support from senior leadership and strong clinical leadership. In medical culture, physicians who stand up and say “this is the right thing to do, I support it and you need to also” have great impact. Others who wait to see if the projects are successful before being publicly associated with them leave nurses and others to push change uphill against the hierarchy; predictably, these efforts are usually less successful. Embedding the changes in the clinical work is essential. The changes need to be perceived as making the day simpler, safer, and easier for everyone. Once the case has been made for change, then having a very clear focus, taking “one bite of the elephant at a time”, getting finite time commitments from the people involved, and measuring and celebrating success are all important components.

This work has been approached from the perspective of defining the practical successful elements that can be spread across our larger care system. The perinatal safety and perioperative briefing elements described above are now being actively transferred. Multidisciplinary teams from across the organisation have been brought together for educational sessions interacting with the clinical sites that implemented these tools and behaviours. The teams are then supported with educational materials, site visits, and ongoing collaborative calls as they proceed with implementation. It is our belief that this process accelerates clinical learning and implementation.

DISCUSSION

We have described the experience to date with human factors training focusing on teamwork and communication within a large, non-profit American health system. The experience to date has shown us the value of embedding standardised tools and behaviours into the care process to improve safety in a progressively more complex care environment. Many of the lessons demonstrating the value of such techniques have been learned in other high reliability industries over the last few decades, and they offer a valuable resource for medicine today.

Cultural change is at the heart of this quest; transforming care from the culture of the individual expert physician to a truly collaborative team environment. Not only do differences in communication styles between physicians, nurses, and others impede this aim, but the complexity of the care
process has made effective communication paramount for safe care. The literature is replete with the frequency and potential devastation of clinical communication failures. For this cultural change to be successful, leadership and physician involvement is critical. Changes need to be embedded in the clinical work, and perceived as providing benefit, not more work to do. Projects need to be clearly focused, so people doing the work can see the benefit of their efforts. This is not a linear process, so flexibility and the ability to adapt to operational pressures and local cultures are important.

To date, we are seeing that teaching and embedding a few basic tools and behaviours can provide tremendous clinical benefit. We have seen improved cultural measures – attitudes surrounding teamwork and safety climate. As mentioned, these measures have been strongly linked in aviation to actual flight crew performance through direct observation and survey instruments.[10] The development of direct observational markers that assess both task performance and the team behaviours of the clinicians working together is currently in progress. Ultimately, our goal is to show a reduction in adverse events and better clinical outcomes through the adoption of these tools and behaviours. A large integrated system such as Kaiser has the potential to measure infrequent events across a large population, and potentially demonstrate a positive impact on their frequency. Although still early in the journey, this patient safety work shows great promise in both enhancing the safety of care and improving the work environment for our clinicians.

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**Key messages**

- Communication failures account for the overwhelming majority of unanticipated adverse events in patients.
- Medical care is extremely complex, and this complexity coupled with inherent human performance limitations, even in skilled, experienced, highly motivated individuals, ensures there will be mistakes.
- Effective teamwork and communication can help prevent these inevitable mistakes from becoming consequential, and harming patients and providers.
- Embedding standardised tools and behaviours such as SBAR (a situational briefing model), appropriate assertion, and critical language can greatly enhance safety. These tools can effectively bridge the differences in communication style between nurses, physicians, and others that result from the current educational process.