In 2000, the publication of the Institute of Medicine (IOM) report *To Err Is Human: Building a Safer Health Care System* was a seminal event for the health care system in the United States. Prior to the publication of this report, many physicians and hospital administrators refused to acknowledge the frequent occurrence of preventable morbidity and mortality and the sad reality that our health care system was not adequately addressing the issue of patient safety. The IOM concluded that tens of thousands of patients were dying each year as a result of medical errors. In the past decade, numerous changes have been endorsed to improve patient safety; these include mandatory minimum nurse-to-patient ratios, a reduction in duty hours for resident physicians, mandatory time-outs before invasive procedures (to confirm patient identity and the procedure to be performed), and the use of simulation and teamwork training in the medical environment. Data from high-risk organizations suggest that health care errors do not usually occur because of ill-trained medical personnel but rather result from systems that “set up” both the patient and health care provider. Wu has aptly called these health care providers “second victims.” This chapter reviews several modalities that can be used to improve patient safety and reduce the incidence and sequelae of medical errors on the labor and delivery unit.

**PATIENT SAFETY**

Traditional assessments of medical error have often blamed individuals and have failed to address the broader systems issues that allowed the error to occur. Newer approaches are based on an understanding that humans will make errors and encourage the creation of robust systems to prevent those errors from occurring or to minimize their effect on patients if they occur. This paradigm change has borrowed heavily from other high-risk industries, such as aviation.

**The Swiss Cheese Model**

Patients are typically not injured by a single event resulting from a single act of a careless individual. More often, an underlying systems problem made the error possible, and numerous individual actions are allowed to “fall through the cracks” of a system that does not “catch” them, resulting in error and harm. James Reason described the “Swiss cheese” model of error (Figure 11-1), in which he explained how numerous contributing factors are responsible for the ultimate harm. Reason developed this model to illustrate how analyses of major accidents and catastrophic systems failures tend to reveal multiple, smaller failures that lead up to the actual adverse event. In Reason’s model, each slice of cheese represents a safety barrier or precaution relevant to a particular hazard. For example, if the hazard were wrong-site surgery, slices of the cheese might include processes for identifying the right or left side on radiographic images, a protocol for signing the correct site when the surgeon and patient first meet, and a second protocol for reviewing the medical record and checking the previously marked site in the operating room. Each barrier has “holes”—hence, the term “Swiss cheese.” For some serious events (e.g., operating on the wrong person), the holes will rarely align; however, even rare cases of preventable harm are unacceptable. Reason’s model highlights the need to think of patient safety as a system of care—a set of organizational and cultural layers that influence and shape one another. Reason has eloquently summarized the process as follows:

Rather than being the main instigators of an accident, operators tend to be the inheritors of system defects created by poor design, incorrect installation, faulty maintenance, and bad management decisions. Their part is usually that of adding the final garnish to a lethal brew whose ingredients have already been long in the cooking.

Figure 11-2 illustrates the use of the Swiss cheese model to evaluate an actual “near-miss” case that involved the misidentification of an obstetric patient who nearly underwent the wrong procedure (a tubal ligation). It shows how
the combination of numerous systems errors came very close to allowing the wrong procedure to be performed. The events unfolded as follows:

1. A nulliparous woman in active labor at term gestation arrived on the labor and delivery unit in severe pain. She spoke a foreign language and was poorly understood by the labor and delivery staff. No translator was called because her husband was helping with the translation.

2. Because the patient was in such severe pain, she hurriedly answered all the questions, and she answered several questions incorrectly. As per hospital policy (owing to HIPAA [Health Insurance Portability and Accountability Act of 1996] regulations), the husband was asked to leave the room while the history was taken, and therefore he was not present to assist with the translation.

3. Another patient on the labor and delivery unit had the same last name and a similar-sounding first name. The hospital protocol for this occurrence was not followed. Patient initials, not last names, were listed on the labor and delivery “board,” so other staff were unaware of the fact that two patients had identical last names.

4. A nonreassuring fetal heart rate (FHR) tracing developed during the patient’s labor, and she was scheduled to undergo urgent cesarean delivery. The obstetric resident physician informed the anesthesiologist of this decision...
and, mistaking the two patients with identical names, informed staff that the patient would undergo a cesarean delivery plus a bilateral tubal ligation. Unlike the other patient with the same last name, the patient going to the operating room did not want or expect a tubal ligation.

5. The surgical case was delayed because of a shift change, and the obstetric residents urged the nurses to hurry. This behavior caused friction between the nurses and the obstetric residents, who did not work as a team. There were no “board rounds,” and communication between labor and delivery staff and operating room staff was lacking.

6. On arrival in the operating room, the patient was anxious and crying. The anesthesiologist administered fentanyl 50 μg to calm the patient, and she became somnolent.

7. A time-out procedure was performed, but no one in the operating room took it seriously. The patient was asleep and did not participate. The attending obstetrician was not present. Conversations continued during the time-out procedure.

8. After the flawed time-out, all agreed that this patient was to undergo a primary cesarean delivery with tubal ligation. Her husband was not present during the time-out procedure, but he was brought to the room immediately afterward. The surgical procedure began.

9. The attending obstetrician arrived after the start of surgery and questioned the planned tubal ligation, not because he was aware of the other patient with the same last name, but because he was informed that this patient was nulliparous. Immediate investigation showed that this patient was not supposed to undergo a tubal ligation. A major error was narrowly averted.

**Medical Errors**

Today there is widespread interest in changing the health care culture in order to build safer systems, including ensuring the appropriate physical work environment, developing redundancies in safety procedures, allowing health care workers to report their mistakes (including “near misses”) without fear of punishment, and providing mechanisms to learn from these experiences. Unfortunately, none of these steps will achieve the ultimate goal of patient safety without the support of physicians as well as hospital administrators. In addition, although they are vital to improving the current condition, these steps do not obviate the need for well-trained and well-rested physicians and nurses.

The American College of Obstetricians and Gynecologists (ACOG) has stated that promotion of patient safety requires that all members of the health care team recognize that the potential for error exists and that teamwork and communication are the basis for fostering change and preventing errors. The ACOG has recommended the following seven safety objectives:

1. Develop a commitment to encourage a culture of patient safety.
2. Implement recommended safe medication practices, including improved legibility of handwriting and avoidance of the use of nonstandard abbreviations.
3. Reduce the likelihood of surgical errors.
4. Improve communication.
5. Identify and resolve systems problems.
6. Establish a partnership with patients.
7. Make safety a priority in every aspect of practice.

Reports of medical errors causing morbidity and mortality are commonly found in the lay press. How should we, as anesthesia providers or obstetricians, define error? The IOM has defined medical error as a “failure of a planned action to be completed as intended, or the use of a wrong plan to achieve an aim.” Communication problems are consistently identified as a leading cause of medical errors in obstetrics, and the Joint Commission (formerly the Joint Commission on the Accreditation of Health Care Organizations [JCAHO]) has said that the lack of effective communication is the primary cause of sentinel events (a sentinel event being “an unexpected occurrence involving death or serious physical or psychological injury, or the risk thereof”).

Progress in patient safety has not been as rapid as was once hoped. Leape and Berwick, two pioneers in the field of patient safety, have suggested that the lack of progress after the release of the initial IOM report is due to the “culture of medicine.” They believe that this culture is deeply rooted, both by custom and training, in autonomous individual performance. We and others believe that systematic and appropriate use of medical simulation, along with other important changes in our health care system, will facilitate the necessary cultural change and lead to improved patient safety.

Labor and delivery units are not intrinsically safer than other health care environments, and most units still have many opportunities to change systems to optimize patient safety. Further, it has been suggested that the concept of patient safety in obstetrics is “not as strong as desirable for the provision of reliable health care.” In many units a punitive culture results in suppression of error reporting, lack of proper communication, and failure of appropriate feedback. Obviously, this culture must change before we can significantly improve patient safety in obstetric practice.

**TEAMS AND TEAMWORK**

Health care should be considered a team activity. Teams take care of patients. Furthermore, health care teams operate in an environment characterized by heavy workload, acute stress, and high stakes for decision and action errors. Individuals have limited capabilities. When the limitations are combined with organizational and environmental complexity, human error is virtually inevitable. The labor and delivery unit is an exceedingly complex environment. In fact, safe intrapartum obstetric care requires intense, error-free vigilance with effective communication and teamwork among members of various clinical disciplines who, although working together, typically have never trained together. This group consists of obstetricians, midwives, anesthesia providers, nurses, and pediatricians. The addition of trainees at all levels and in all disciplines enhances the potential for error in communication.
A team consists of two or more individuals who have specific roles, perform independent tasks, are adaptable, and share common goals. Salas et al. have called teamwork a complex yet elegant phenomenon. It can be defined as a ‘set of interrelated behaviors, actions, cognitions and attitudes that facilitate the required task work that must be completed.’ Lack of teamwork has been identified as a leading cause of adverse events in medicine. Team behavior and coordination, particularly communication or team information sharing, are critical for optimizing team performance. Baker et al. have stated that to work together effectively, team members must possess specific knowledge, skills, and attitudes (KSAs), including skill in monitoring one another’s performance, knowledge of their own and their teammates’ task responsibilities, and a positive disposition toward working in a team. These researchers have described characteristics of effective teams as team leadership, mutual performance monitoring, backup behavior, adaptability, shared mental models, communication, team/collective orientation, and mutual trust. Moreover, effective team performance in complex environments requires that team members hold a shared understanding of the task, their equipment, and their teammates. Salas et al. have defined the characteristics of effective teams, as highlighted in Table 11-1.

Teamwork is essential for safe patient care. The IOM has suggested that team training and implementation of team behaviors may improve patient safety. Team training promotes the acquisition of adaptive behaviors, shared cognition, and relevant attitudes. It is an instructional strategy that ideally combines practice-based delivery methods with realistic events, guided by medical teamwork competencies (i.e., behaviors, cognitions, and/or attitudes). In a 2007 editorial, Murray and Enarson stated that “when a crisis complicates patient care, teamwork among health care professionals is frequently strained, resulting in more frequent as well as more serious failures in managing critical events.” This scenario occurs all too often on the labor and delivery unit.

Team Leadership

There is a clear difference between the leadership of individuals and team leadership. A health care provider who is leading independent individuals will diagnose a problem, generate possible solutions, and implement the most appropriate solution. In contrast, team leadership does not involve autocratic “top-down” communication of solutions to team members but, rather, consists of defining team goals, setting expectations, coordinating activities, organizing team resources, and guiding the team to achieve the team’s goals.

Team leaders can improve team performance in many ways (e.g., by promoting coordination and cooperation). These individuals not only must be technically competent but also must be competent in leadership skills. Anesthesiologists and other physicians often are not trained to be competent team leaders. Many of the necessary tasks can and must be learned during team training. Simulation may play a key role in this education. Team leadership training has been developed to successfully teach specific team leader behaviors, and the implementation of these programs has been shown to improve team performance. Hackman described successful team performance as consisting of the following three primary elements:

- Successful accomplishment of the team’s goals.
- Satisfaction of team members with the team and commitment to the team’s goals.
- The ability of the team to improve different facets of team effectiveness over time.

The Joint Commission has recommended a risk-reduction strategy for decreasing the incidence of perinatal injury and death. This strategy includes the implementation of team training and the performance of mock emergency drills for shoulder dystocia, emergency cesarean delivery, and maternal hemorrhage. Several of the 2008 Joint Commission National Patient Safety Goals relate to error reduction on the labor and delivery unit. Departments of anesthesiology and obstetrics and gynecology should regularly review these goals (Box 11-1). Hospitals are surveyed periodically to verify their compliance with these goals.

High-Reliability Organizations and Teams

Despite the inevitability of human error, some organizations that operate in complex environments are able to maintain an exceptionally safe workplace. These organizations, including the aviation and nuclear power industries, have been termed high-reliability organizations (HROs). Hospitals and other health care organizations can and should be HROs. Sundar et al. defined high-reliability organizations as institutions in which individuals, working together in high-acuity situations and facing great potential for error and disastrous consequences, consistently deliver care with positive results and minimal errors. Teams that exhibit behaviors facilitating the characteristics and values held by the HRO may be defined as high-reliability teams.

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**TABLE 11-1 Characteristics of Effective Teams**

<table>
<thead>
<tr>
<th>Knowledge/Skills/Attitudes</th>
<th>Characteristics of the Team</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadership</td>
<td>Roles are clear but not overly rigid.</td>
</tr>
<tr>
<td></td>
<td>Team members believe that leaders care about them.</td>
</tr>
<tr>
<td>Backup behavior</td>
<td>Members compensate for one another.</td>
</tr>
<tr>
<td></td>
<td>Members provide feedback to one another.</td>
</tr>
<tr>
<td>Mutual performance monitoring</td>
<td>Members understand one another’s roles.</td>
</tr>
<tr>
<td>Communication adaptability</td>
<td>Members communicate often and anticipate one another.</td>
</tr>
<tr>
<td>Mutual trust</td>
<td>Members trust one another’s intentions.</td>
</tr>
</tbody>
</table>

HRTs. Wilson et al. 16 have defined five guidelines for HRTs, which must:

1. Use closed-loop communication and other forms of information exchange to promote shared situational awareness regarding factors internal and external to the team.
2. Develop shared mental models that allow team members to monitor other members’ performance and offer backup assistance when needed.
3. Demonstrate a collective organization that enables members to be assertive, to take advantage of functional expertise, and to seek and value input from other team members.
4. Seek to recognize complexities of their task environment and accordingly develop plans that are adequate and promote flexibility.
5. Use semi-structured feedback mechanisms such as team self-correction to manage, and quickly learn from, errors.

Hunt et al. 30 defined the following characteristics associated with high-performing teams: situational awareness, leadership, followership, closed-loop communication, critical language, standardized practice, assertive communication, adaptive behaviors, and workload management. Salas et al. 31 have described an adaptive team performance framework that illustrates the relationship among variables, emerging states, and the multiple phases of the team adaptation cycle (Figure 11-3).

Cultural factors may play a significant role in team performance. According to Salas et al., 22 these factors include attitudes (especially as they relate to previous experiences with teams) and motivation. Although it has been suggested that an individual team member’s personality may be counterbalanced by others’, Janis 32 concluded that openness, conscientiousness, and neuroticism are essential for individuals to succeed in command positions.

**BOX 11-1 Key Joint Commission* National Patient Safety Goals**

- Improve the accuracy of patient identification:
  - Use at least two patient identifiers when providing care.
  - Before the start of any invasive procedure, conduct a “time-out” to confirm the correct patient, procedure, and site.
- Improve the effectiveness of communication among caregivers:
  - Read-back verbal orders.
  - Standardize a list of abbreviations.
  - Measure, assess, and if appropriate, take action to improve timeliness of reporting and the receipt of critical test results.
  - Implement a standardized approach to hand-off communications.
- Improve the safety of using medications:
  - Standardize and limit the number of drug concentrations.
  - Identify and review a list of look-alike/sound-alike drugs used by the organization.
  - Label all medications.
- Reduce the risk of health care–associated infections:
  - Comply with Centers for Disease Control and Prevention (CDC) hand-hygiene guidelines.
- Accurately and completely reconcile medications across the continuum of care:
  - Implement a process for comparing the patient’s current medications with those ordered for the patient.
  - Communicate a complete list of the patient’s medications to the next provider.


**ADAPTIVE TEAM PERFORMANCE**

Thomas et al.\textsuperscript{33} conducted a qualitative assessment of teamwork and suggested that factors that influence the ability to work together could be divided into three categories: \textit{provider characteristics} (personal attributes, reputation, expertise); \textit{workplace factors} (staffing, work organization, work environment); and \textit{group influences} (communication, relationships, and teamwork). Team members can address categories, at least in part, by working together in teams in a simulated environment that allows evaluation of teamwork and human performance. Lyndon\textsuperscript{34} suggested that the application of human performance–based theory has demonstrated that “communication patterns, team function, workload, and coping mechanisms affect both individual and group ability to identify evolving problems and make appropriate management decisions in complex decision-making situations.”\textsuperscript{34}

**Team Training**

Patient safety is “predicated on trust, open communication, and effective interdisciplinary teamwork.”\textsuperscript{35} It is often the \textit{interactions} among health care workers that determine whether a specific plan of care is effective or ineffective.\textsuperscript{36} However, in the current environment, attending physicians, midwives, nurses, resident physicians, and medical students rarely learn or train to work as teams.

The Liaison Committee on Medical Education (LCME), which is jointly composed of members of the American Medical Association and the Association of American Medical Colleges, has affirmed the importance of teaching communications skills and teamwork. For example, LCME standard ED19 states that “there must be specific instruction in communication skills as they relate to professional responsibilities, including communication with patients, families, colleagues, and other health professionals.”\textsuperscript{37} Teamwork needs to be not only taught but also monitored. Box 11-2 summarizes best practices in team performance measurement in simulation-based training.

Why is teamwork training important for labor and delivery unit personnel? As stated previously, communication problems are consistently identified as a leading cause of medical error, and these problems can be addressed during team training. The 2000-2002 Confidential Enquiry into Maternal Deaths in the United Kingdom emphasized that “emergency drills for maternal resuscitation should be regularly practiced in clinical areas in all maternity units.”\textsuperscript{38} As an example, a review of competence in managing cardiac arrest among obstetric trainees in the United Kingdom documented a lack of knowledge about airway management and ventilation.\textsuperscript{39} The authors of the report suggested that regular short periods of practice on a mannequin are necessary to facilitate retention of resuscitation skills.\textsuperscript{39} Furthermore, research in simulation-based team training has shown that simulation performance improves when trainees have an opportunity to practice relevant competencies in a structured scenario and then receive diagnostic feedback on their individual and collective performance. This finding clearly indicates the importance of (1) guided practice of structured scenarios and (2) assessment of performance.

**BOX 11-2 Summary of Best Practices in Team Performance Measurement**

- Ground measures in theory:
  - Use theory to determine what variables to measure.
  - Capture aspects of input→process→output models of team performance.
- Design measures to meet specific learning outcomes.
- Clearly articulate the purpose of measurement.
- Design the measurement system to capture information necessary for making decisions about the learning outcomes.
- Capture competencies.
- Measure multiple levels of performance.
- Link measures to scenario events.
- Focus on observable behaviors.
- Incorporate multiple measures from different sources.
- Capture performance processes in addition to outcomes:
  - Obtain information not only about the end result, but also about how the team reached that performance outcome.
- Train observers and structure observation protocols.
- Facilitate post-training debriefing and training remediation.


**Simulation-Based Training in Obstetrics**

Traditional medical and nursing education has relied on the treatment of real patients in actual clinical settings. Many educators now believe that the current availability of medical simulation and the knowledge gained from the science of team training may improve patient outcomes. Most medical and nursing schools have purchased simulators and are attempting to use them in undergraduate and graduate education.

Many researchers have suggested that drills are useful on the labor and delivery unit. Sorensen\textsuperscript{40} stated that “mock emergency training is an opportunity for staff to learn to identify risk factors and prepare for interventions in the event of an obstetric emergency.” According to the Agency for Healthcare Research and Quality (AHRQ),\textsuperscript{41} “drills that are carefully planned can decrease medical errors by addressing unintended events that may result in injury to a patient arising from unintentional actions, mistakes in judgment, or inadequate plans of action.” Gardner and Raemer\textsuperscript{42} suggested that simulation is a practical and safe approach to the acquisition and maintenance of task-oriented and behavioral skills across the spectrum of medical specialties.

In the realm of obstetric anesthesia practice, investigators have demonstrated that simulation may be a useful tool for assessment of performance in a simulated emergency situation (e.g., failed intubation) when combined with practice and formal teaching.\textsuperscript{43} Use of high-fidelity simulation for training in the management of perinatal emergencies improved the speed with which anesthesia providers responded to those emergencies and improved the quality...
of their care. Johannsson et al. suggested that simulation can be used as an educational tool to assist in transfer of knowledge, application of diagnostic skills, acquisition of surgical skills, emergency drill training, and team training. It is obvious that all of these factors are important components of care on the labor and delivery unit. Box 11-3 outlines the advantages of simulation for research, training, and performance assessment.

When an adverse perinatal outcome associated with an error occurs, it is likely that more than one individual will be involved and blamed. Similarly, when an unexpected injury occurs to a mother or infant, several providers are typically involved, and often there is an issue with the “system” that allowed the error to occur. Obstetricians, midwives, anesthesia providers, pediatricians, labor nurses, and operating room staff all work together as part of this system. Therefore, optimal simulation exercises involve all these key “players” and evaluate not only their behaviors and communication skills but also problems within the system in which they work. Simulation of reality-based scenarios in the labor and delivery unit or operating room allows anesthesia providers, obstetricians, midwives, nurses, and pediatricians to practice their roles and communication skills. Hunt et al. suggested that medical teams require practice in interaction and communication to be effective and efficient. Simulations of perinatal events range from highly realistic scenarios using high-fidelity human simulators (typically located off-site) to low-tech simulations and drills that can be performed on the labor and delivery unit. Simulated events commonly consist of maternal hemorrhage (antepartum as well as postpartum), failed intubation, failed neuraxial blockade, seizures, cardiac arrest, anaphylaxis, umbilical cord prolapse, and shoulder dystocia. Thompson et al. reported that drills to practice management of eclampsia were successful in the identification of deficiencies in team preparation. These researchers concluded:

Repetition of drills in our unit has improved the care of simulated patients with eclampsia. In subsequent drills patient management has followed evidence-based practice, with an enhanced level of efficiency. Staff [are] summoned faster, the resuscitation process is better organized, and drugs are prepared and administered more quickly.

Similarly, Crofts et al. reported significant improvement in participants’ knowledge after multidisciplinary obstetric emergency training.

Simulated scenarios (structured to facilitate desired learning outcomes) can be designed to train nurses, obstetric and anesthesiology resident physicians, and students individually or as teams. Team training, however, should not be reserved for individuals in training; attending physicians may also benefit from participation. These drills not only enable various team members to practice articulating an appropriate plan during a crisis situation but also allow practice in communication among members of the operating room team and provide an opportunity for team members as well as administrators to identify areas that require further attention and improvement.

Maslovitz et al. used simulation to identify five recurrent obstetric management mistakes, which are as follows:

- Delay in transporting a bleeding patient to the operating room.
- Unfamiliarity with prostaglandin administration to treat uterine atony.
- Poor cardiopulmonary resuscitation techniques.
- Inadequate documentation of shoulder dystocia (which is important for the legal defense of these cases).
- Delayed administration of blood products to treat disseminated intravascular coagulation.

The drills advocated for use by labor and delivery staff at the University of Miami Miller School of Medicine/Jackson Memorial Hospital are outlined in Box 11-4.

Simulation-based training must be implemented appropriately if it is to be effective. Salas et al. suggested the following guidelines for appropriate implementation:

1. Understand the training needs and requirements.
2. Embed instructional features (such as performance measurement and feedback) within the simulation.
3. Craft the scenarios on the basis of expected/desired learning outcomes.
4. Create opportunities for assessing and diagnosing individual and/or team performance within the simulation.
6. Focus on the cognitive and psychological fidelity of the simulation.
The labor and delivery unit. Awad et al.51 reported that health care, especially in complex environments such as the operating room, as assessed by team members using a validated scoring system. Why initiate team training on the obstetric service? The following case report by Sachs52 illustrates the need. A healthy 38-year-old patient's protracted hospital course. In particular, Sachs reported that communication was poor, and there was a lack of mutual performance cross-monitoring, inadequate conflict resolution, suboptimal situational awareness, and work overload.

CREW RESOURCE MANAGEMENT

Although relatively new to obstetrics, team drills have been used successfully in other areas of medicine, including anesthesia, intensive care, and emergency medicine, often using lessons learned from crew resource management (CRM) training. The human error factors in many aviation disasters are thought to involve failure of communication, decision-making, and leadership.53 In the airline industry, CRM began as a program to train pilots to reduce error by making better use of human resources in the cockpit.54 CRM training has led to safety and performance improvements beyond those produced by improvements in equipment and technology.53

CRM training is just one of many tools used by airlines to reduce human error. Other tools include the use of checklists, standardized maintenance, ability to report errors without fear of punitive retaliation, and use of simulator training. Not all of these tools, however, are easily adaptable to medicine. That said, Helmreich55 identified several lessons learned from CRM that can be extrapolated to the practice of medicine. Helmreich believes that errors in competence require technical training and that errors in decision-making and communication require team training. Further, Helmreich55 has suggested that adaptation of CRM to health care also requires the development of nonpunitive methods to collect information on errors so that this information can be used to evaluate and improve team performance. It has been suggested that elements of CRM that are useful in health care settings include briefings, conflict resolution, suboptimal situational awareness, and stress affect performance among aviators working together in teams.56 Evidence also suggests that these attitudes are relevant in the health care environment.57

Salas et al.58 suggested that CRM training will not be effective or achieve its desired outcomes in health care without the following 12 prerequisites:

1. The physicians must be “on board.”
2. The concept of teamwork becomes part of the “DNA” of the health care professional.
3. CRM is supplemented by other teamwork-focused training strategies.
4. The design, development, and delivery of CRM are scientifically rooted.
5. CRM training is designed systematically.
6. CRM is part of a learning organization’s strategy to promote patient safety and quality care.
7. Teamwork is rewarded and reinforced by the health care provider.
8. CRM training is evaluated at multiple levels for specific outcomes.
9. CRM is supported by simulation or practice-based approaches.
10. The health care provider is “ready” to receive training.
11. The patient is part of the team.
12. The team training is recurrent.

Team Training in Obstetrics

As noted, teamwork is critical for the delivery of quality health care, especially in complex environments such as the labor and delivery unit. Awad et al.51 reported that medical team training improved communication in the operating room, as assessed by team members using a validated scoring system. Why initiate team training on the obstetric service? The following case report by Sachs52 illustrates the need. A healthy 38-year-old woman needed emergency cesarean delivery after a failed instrumental delivery. At surgery, the uterus was found to be ruptured and the fetus was stillborn. After unsuccessful attempts to repair the uterus, the patient underwent a cesarean hysterectomy and required massive transfusion and a 3-week hospital stay. Was anyone at fault? According to the root cause analysis, lack of teamwork on many levels played a significant role in this patient’s protracted hospital course. In particular, Sachs reported that communication was poor, and there was a lack of mutual performance cross-monitoring, inadequate

**BOX 11-4 Drills Advocated for Use by Labor and Delivery Staff Undergoing Team Training**

- Profound fetal bradycardia
- Magnesium sulfate overdose
- Shoulder dystocia
- Maternal hemorrhage
- Failed intubation
- Anaphylaxis
- Amniotic fluid embolism
- Severe preeclampsia/eclampsia/HELLP (hemolysis, elevated liver enzymes, low platelet count) syndrome

*Used at the University of Miami Miller School of Medicine/Jackson Memorial Hospital Center for Patient Safety.*
Some health care providers benefit more than others from CRM training and learning. For example, one study noted that physicians with poorer performance at the beginning of CRM training showed greater improvement after training.59

DISRUPTIVE BEHAVIOR
Although miscommunication is common on the labor and delivery unit, some events are not caused by difficulties with communication but, rather, result from disruptive behavior on the part of one or more members of the team. It is estimated that 3% to 5% of physicians exhibit disruptive behavior.60 Disruptive and intimidating behavior occurs frequently on labor and delivery units and is observed in personnel of diverse disciplines, including obstetricians, anesthesia providers, family physicians, pediatricians, nurses, midwives, and administrators. In one survey, disruptive behavior was reported on more than 60% of labor and delivery units that responded to a questionnaire.61

Disruptive behavior may consist of angry outbursts, rudeness, verbal attacks, physical threats, intimidation, non-compliance with policies, or sexual harassment. Disruptive behavior contributes to the nursing shortage and predisposes to “near misses” and adverse occurrences. This behavior does not always involve physicians. The occurrence of disruptive behavior among nursing staff, termed horizontal hostility, includes rudeness, verbal abuse, humiliating statements, unjustly critical statements, withholding of information, and gossip.62 Disruptive behavior is not always effectively managed by the organization63 and must be considered when simulation is used to improve team behaviors.

OPTIONS FOR SIMULATOR TRAINING IN OBSTETRICS
Both high-technology and low-technology approaches to simulation have been utilized for training labor and delivery staff.40 Simulation centers often use high-fidelity simulation with interactive computerized mannequins in a realistic working environment (e.g., labor room or operating room) that contains a full complement of working equipment and staff.53 The mannequin is quite realistic; it has a pulse, heart and breath sounds, ventilatory movements, and electrocardiogram and pulse oximetry tracings. All vital signs can be adjusted via computer control, as can the ability to intubate or ventilate.63

Not all simulation exercises and drills for obstetrics must be performed in high-fidelity simulators. Some authorities44 have argued that classroom training is a better option, particularly given the high cost65 and high level of resources necessary for high-fidelity simulation. The inability to arrange for staff of several disciplines to be absent from the labor and delivery unit simultaneously often precludes the use of high-technology simulation and may make on-site exercises more practical.40

On the other hand, Gaba66 has countered that high-fidelity simulation need not be cost-prohibitive and that it provides the required realistic experience necessary for training in the management of complex real-life scenarios. In 2007, Morgan et al.57 described an obstetric simulation model that allowed participation of trained surgeons (rather than actors playing the role of surgeons). This was the first published report of high-fidelity simulation of obstetric team performance, with obstetricians, anesthesia providers, and nurses involved in the hands-on management of obstetric crises.

Several options are available for teaching teamwork and crisis intervention in obstetrics. Multidisciplinary obstetric simulated emergency scenarios (MOSES), developed by the St. Bartholomew Hospital Group in the United Kingdom,68 involves participation by obstetricians, anesthesia providers, and midwives in team training using a high-fidelity simulator. MedTeams was developed by the United States Armed Forces and Dynamics Research Corporation; originally employed in emergency departments, it has now been used for team training in labor and delivery units.17 The course consists of “train the trainer” sessions that focus on seven dimensions essential to teamwork. Behaviorally anchored rating scales (BARS) are used to assess various key behaviors.55 A review of the program and the challenges of its implementation was published in 2006.71

Other evidence-based programs have emerged. TeamSTEPPS was developed by the U.S. Department of Defense (DOD) and the Agency for Healthcare Research and Quality as a team training and implementation toolkit.72 The program is based on findings from the science of team performance; it is adaptable, medically relevant, and applicable to training on labor and delivery units.

The 2000-2002 report of the Confidential Enquiry into Maternal Deaths in the United Kingdom69 recommended the MOET (Managing Obstetric Emergencies and Trauma) course. This 3-day course consists of lectures, skills training, workshops, and resuscitation stations. It is designed for both obstetricians and anesthesia providers and is offered by the Advanced Life Support Group, a registered medical education charity (http://www.alsg.org).

What is the evidence that team training and simulation reduce errors and improve patient safety and clinical outcomes? Morey et al.53 reported that the MedTeams program reduced errors in the emergency department; they also observed a statistically significant improvement in team behaviors. The clinical error rate in providers who received MedTeams training dropped from 31% to 4%. Evidence suggests that medical simulation and team training improve teamwork and communication and allow recognition of potential areas of weakness in obstetric care. We believe that these are viable strategies to mitigate medical errors. Despite a somewhat short and unproven track record and a paucity of objective findings of improvement in patient safety and outcomes, many other researchers concur that team training is useful in the health care setting.20,29,73 We agree with Pearlman et al.,74 who stated:

*We have the moral imperative as a specialty to fully engage in the identification of our own best practices, to advance safety research in obstetrics and gynecology, and to implement broadly those practices which are best.*

*Health care providers who want to learn more about the field of simulation might consider attending the annual meeting of the Society for Simulation in Healthcare. This multidisciplinary society represents a rapidly growing group of clinicians, educators, and researchers who utilize a variety of simulation techniques for education, testing, and research in healthcare (http://www.ssih.org/public/).
KEY POINTS

- Medical errors harm tens of thousands of patients each year.
- Human error is inevitable; therefore systems should be developed to prevent or “catch” errors before the patient is harmed.
- Poor communication among health care workers is the primary cause of sentinel events.
- Teamwork is essential to safe patient care, and team training may improve patient safety.
- Simulation-based training is an educational tool that may improve responses to obstetric emergencies.
- Adaptation of some elements of aviation crew resource management training may improve team performance in health care.
- Disruptive behavior interferes with safe patient care and is observed in physicians as well as other members of the health care team.

REFERENCES


37. Liaison Committee on Medical Education. Functions and Structure of a Medical School: Standards for Accreditation of Medical Education Programs Leading to the M.D. Degree. Chicago, LCME, 2007. Available at: http://www.lcme.org/functions2007jun.pdf/


