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Lessons from the cockpit: How team training can reduce errors on L&D

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Although many ob/gyns believe they already work on an interdisciplinary team, most don't really apply the principles of teamwork on labor and delivery. This Harvard team has discovered that applying the concepts used by military and commercial flight teams—an approach called Crew Resource Management—can improve patient safety and reduce the epidemic of lawsuits plaguing the specialty.

Preventable medical errors account for more deaths each year than breast cancer, automobile accidents, or drownings. Poor communication among health-care workers is the most common cause of these errors.[1,2] This state of affairs is due in part to the fact that patient care is still provided by clinicians who are compartmentalized into separate disciplines, the so-called "silo approach" to health care. Changing this culture is going to require team training across disciplines, encompassing obstetricians, midwives, nurses, and anesthesia providers. And while this approach may meet some resistance, we're convinced by the data—and our own clinical experience—that it

will provide a safety net that helps reduce preventable errors and medical malpractice suits.

The impact of preventable medical errors was recognized by the Institute of Medicine in its 1999 landmark report on patient safety, *To Err is Human*, which estimated that 45,000 to 98,000 Americans die annually and cost the nation about $29 billion.[3] What many critics forget, however, is that these errors are often made by highly skilled professionals and are generally the result of system failures, not substandard individual performance. Unfortunately, despite our best intentions, errors occur, patients die, and the clinicians involved often become the "secondary victim."[4]

Currently, in most labor and delivery units, patient information is not shared in a coordinated way between providers. When there's a shift change, for instance, nurses sign out to nurses, obstetricians hand off patients to obstetricians—often by phone or e-mail—residents attend teaching rounds, and rarely are anesthesiologists and neonatologists included in any sign-out of important information regarding OB

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patients. Adding insult to injury, physicians, nurses, pharmacists, and ancillary staff all come from diverse educational and training backgrounds, which means they speak a somewhat different language.

Finally, as medical malpractice costs increase, physicians have been forced to work longer hours and care for more patients just to pay premiums, which in some states exceed $150,000 per year.[5] Research indicates that physicians working longer hours make more errors.[6]

Article at a glance

- The IOM report, *Crossing the Quality Chasm*, recommended that health-care organizations establish interdisciplinary team training programs for clinicians to incorporate the proven team training strategies used in the aviation industry.

- Most cases of perinatal death and injury are caused by problems with an organization's culture and with communication among caregivers, according to JCAHO.

- The team approach at Beth Israel Deaconess Medical Center consists of a core team, coordinating team, and contingency team.

- The Beth Israel Deaconess Medical Center malpractice claims, suits, and observations (monies placed in reserves for potential claims) dropped by more than 50% after putting the team approach into practice in the period from 2002 to 2005.

What's wrong with the current system?

It may seem obvious, but health-care professionals are interdependent and have to effectively communicate and coordinate their activities to provide efficient and safe patient care. With that in mind, the second IOM report in 2001, *Crossing the Quality Chasm*, recommended that health-care organizations establish interdisciplinary team training programs for clinicians to incorporate the proven team training strategies used in the aviation industry.[7]

The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) noted in a Sentinel Alert issued in July 2004 that most cases of perinatal death and injury are caused by problems with an organization's culture and with communication among caregivers. That prompted the accrediting agency to recommend that organizations conduct team training in perinatal areas to teach staff to work together and communicate more effectively.[2] Not coincidentally, communication is one of the six core competencies of Accreditation Council for Graduate Medical Education (ACGME) that requires residents to "demonstrate interpersonal and communication skills that result in effective information exchange and teaming with patients… and professional associates."[8] With the advent of the resident 80-hour workweek and shorter shifts, these skills are even more important to improve hand-offs.

While most clinicians feel that they already work in teams, the plain truth is they often *don't*. Teamwork concepts are rarely taught in the curricula of most health-care professional training programs and are not yet commonplace in medical practice.[9] Continuing educational forums rarely include obstetrics, anesthesia, and nursing in one room, despite the desperate need for precise communication between these providers.
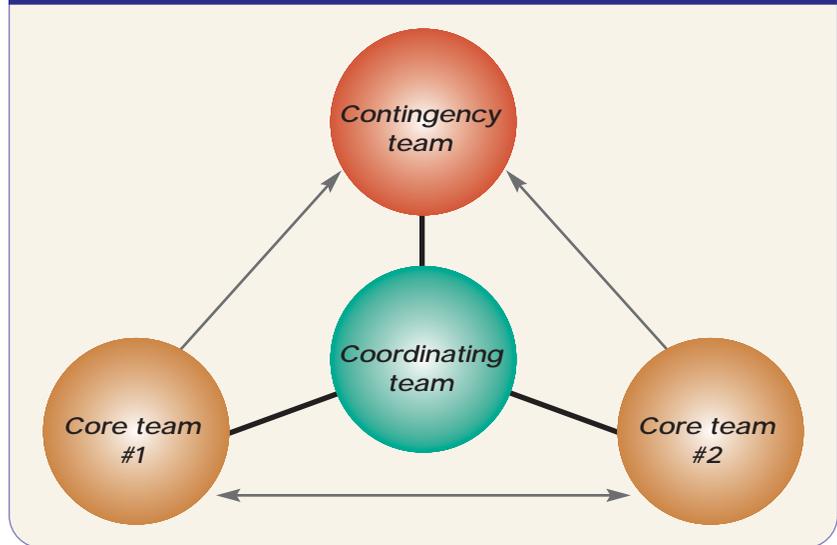
Taking a lesson from aviation crews

The science of teamwork skills and training has been studied in the US military and commercial aviation for the past 20 years.[10-12] Cockpit or Crew Resource Management was developed in the 1970s after the Military Inspector General identified that 70% of aircraft-related fatalities were a result of human error and poor teamwork.[13] The aviation industry's success in reducing critical errors has spared many lives and saved a great deal of money.[14]

The Department of Defense, in conjunction with the Risk Management Foundation of the Harvard Medical Institutions, funded a study to help L&D units put Crew Resource Management principles to good use.[15] Pairs of hospital-based physicians and nurses were trained as instructors and coaches

for the participating institutions, and as part of the implementation of the teamwork concepts, the instructor pairs taught the 4-hour curriculum to the entire obstetrical staff at their hospital. The instructors then became coaches to help each unit really *behave* like a team. While this process can take about 3 months, establishing a culture of patient safety may take 1 to 2 years.

The structure for managing patient care in L&D units varies from hospital to hospital. The team structure that we identified is comprised of three interdependent types of teams (Figure 1):

The core team, consisting of nurses, obstetricians, midwives, anesthesia staff, residents (if applicable), and scrub technicians, provides direct patient care. In the past, these clinicians have worked side by side but care has not been coordinated for the needs of the unit as a whole. Frequent brief interdisciplinary team meetings on the unit allow for exchange of important patient and staff information.

The coordinating team is responsible for the "big picture"; specifically, managing the unit's workload, conflict resolution, triaging of cases, and the maintenance of team structure. They maintain the global vision of all activities on the unit and are able to prioritize workflow such as delaying elective cases based on the acuity of the unit. This team is comprised of representatives from obstetrics, nursing, and anesthesia. In teaching institutions, a chief resident would also be on this team.

The contingency team consists

FIGURE 1. The team approach at a glance

of predetermined individuals from the core teams who have been assigned roles in responding to emergent situations. An emergency cesarean delivery or a patient with a significant postpartum hemorrhage, for instance, requires different disciplines to work together and communicate quickly and efficiently. The importance of having an identified team leader and designated roles for the team members reduces confusion and duplication of efforts that sometimes occur in these situations. The contingency team assembles for a limited time based on the needs of the emergent situation.

Once teams have been formed and the structure maintained, they can generate a series of error prevention strategies. We believe having a well-defined and recognized care management team leads to better communication, improved workload management and efficiency, and error prevention.

Devising a strategy to prevent errors

Team meetings. A multidisciplinary meeting involving all providers is an excellent opportunity to share important patient information. A meeting of the entire obstetrical care team allows all clinicians to develop a shared vision of each patient's care plan and identify potential problems on the unit (see "Asking the right questions during a team meeting," page 40).

Situation monitoring. The term "situation awareness," derived from aviation, refers to knowing the conditions that can affect one's work.[16] This concept certainly applies to medicine. In caring for laboring patients, situation awareness may include abnormal physical or laboratory values, abnormal fetal heart tracings, as well as availability of physicians and operating rooms. A team meeting gives providers the needed awareness of the situation, allows clinicians to articulate patients' care plans, and provides an

Asking the right questions during a team meeting

1. What pertinent patient information (e.g., fetal heart rate concerns, history of postpartum hemorrhage, abnormal labs) is available?

2. Which providers are available and when? (e.g., coverage issues for obstetricians in operating room)

3. What resources are available? (e.g., how many cesarean deliveries need to be done and how many beds are available?)

4. What about staff availability? (e.g., estimation of workload and need to redistribute work or call in additional staff)

5. What is the expected elective and non-elective work for the unit? (e.g., likely admissions from triage area and inductions of labor)

opportunity to create a shared vision or a "shared mental model."[17]

Once an L&D unit has established a shared mental model that takes into account the acuity of the patients, the workload of the entire unit, and patient care plans, situational monitoring is possible. Situation monitoring occurs when providers scan the environment for potentially unsafe conditions or practices. A team member can then intervene to prevent or mitigate adverse events.

Let's use the second stage of labor as an example of situation monitoring: Physicians and nurses can lose perspective on the progress of fetal descent or the severity of fetal heart rate abnormalities. Situation monitoring would allow another provider to raise concerns regarding a patient's FHR tracing displayed on a central monitor. This action allows the patient's care team to regain perspective and reassess the plan for the patient. Figure 2 shows the relationships of situation awareness, a shared mental model, and situational monitoring.

**Communication.** All team interactions are dependent on clear and respectful communication among the varied disciplines on an L&D unit. Too often clinicians assume that all pertinent patient information has been communicated to those who need to know; that presumption can result in overlooked laboratory results or exchange of incomplete vital patient information.

There are ways to deal with this kind of poor communication. Designating tasks such as verbal orders to individuals and having that individual articulate back the task, called a "check-back," is helpful. Another important information exchange occurs during the hand-off between providers of patient care. An exchange of incomplete or ambiguous information can also result in medical errors. We use the acronym SWAP to help us remember the pertinent information that needs to be exchanged during a handoff between providers: **S**ummary of patients; **W**orkload resource management; **A**bnormal physical findings and lab values; **P**lan of care.

Miscommunication can also take the form of conflict. Such conflict can occur when individuals have different perspectives and priorities. Two teamwork strategies can prevent this problem. A team meet-

FIGURE 2. Interaction between situation awareness, monitoring, and shared mental model
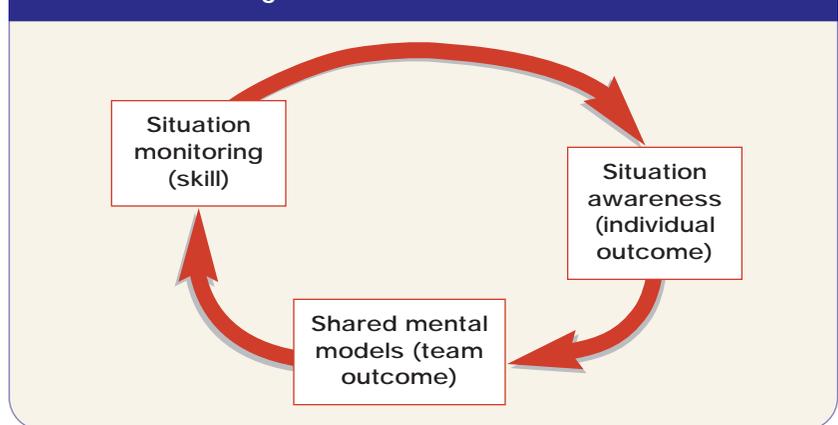
Situation awareness (SA) comes from monitoring one's surroundings and facilitating the development of the care plan. A "shared mental model" occurs when awareness of the situation is shared with one's team members and all clinicians are on the same page. Situation monitoring can detect deviation from the care plan.

ing can be called to improve the team's global awareness of each clinical situation and shared mental model and help prioritize the workload.

A second strategy for conflict prevention is the "two challenge rule," which also comes from the aviation industry. This requires a team member to state his or her concerns a second time in a respectful manner if the unsafe condition is not corrected after the first time the concern is raised.[18]

Despite these techniques, conflict can still occur. Unfortunately, health-care professionals are rarely taught how to resolve conflicts. JCAHO requires that each organization have a conflict resolution policy for these situations.[19] Additional skills can be taught to help individuals prevent and manage conflicts.

Mutual support. Most hospitals have experienced the phenomenon of the "bus" of patients arriving at 5:00 AM. Many clinicians on L&D floors don't appreciate the need to support one another. By nature, members of the unit have varied and fluctuating workloads, which is why it's important for providers to identify conflicting demands and find ways to help one another out. For a physician, mutual support could mean explaining coverage arrangements to a nurse caring for his or her laboring patient while that physician is performing surgery. For a nurse, it can involve offering to take on certain tasks, such as doing vital signs, when a colleague has a greater workload. This mutual support can be

TABLE 1

Adverse Outcome Index

Index measures	Weighted score
■ Maternal death	750
■ Intrapartum and neonatal death > 2,500 g	400
■ Uterine rupture	100
■ Maternal admission to ICU	65
■ Birth trauma	60
■ Return to OR/L&D	40
■ Admission to NICU > 2,500 g and for > 24 hours	35
■ Apgar < 7 at 5 minutes	25
■ Blood transfusion	20
■ 3° or 4° perineal tear	5

The AOI is the percentage of patients with one or more of 10 identified adverse events. These measures can be used to assess quality of care on L&D floors. The weighted adverse outcome score is the average score of each patient that delivers on the OB unit.

vital for patient care and builds trust among providers. That in turn promotes greater staff satisfaction and enhanced patient trust.

When a genuine teamwork culture has been created on your unit, it generates improved knowledge, skills, and attitudes among the staff. Maintaining team structure and error management through improved communication, situation monitoring, and mutual support are the foundation. The knowledge gained results in the staff's acceptance of a shared mental model regarding the patients and acuity of the unit. The improved skills lead to safer, more effective patient care. This can foster greater mutual trust and better understanding among clinicians.

Measuring performance. An Adverse Outcome Index (AOI) measure was recently developed by an expert consensus panel to assess quality of care in L&D units, and to determine whether improved teamwork improves clinical outcomes.[20] The AOI is the percentage of patients with one or more of 10 identified adverse events (Table 1). In order to distinguish high from low severity adverse events, we developed a weighted score for each outcome. The weighted adverse outcome score (WAOS) is the average score for each patient who delivers on the ob unit. The severity index (SI) is the average score for each patient who suffers one or more adverse event. The National Perinatal Information Center analyzed discharge coding data from 20 hospitals for which all 10 data elements of the AOI were available. This analysis included discharge data on more than 80,000 deliveries per year from 2000 to 2004. The average AOI ranged between 9.3% and 10.3% for the 5-year period.

Triggered by a sentinel event in 2001—namely a tragic case in which a healthy woman suffered fetal loss, a hysterectomy, and an extended hospital stay—Beth Israel Deaconess Medical Center enhanced their quality assurance/quality improvement (QA/QI) programs and implemented a teamwork initiative to promote a culture of patient safety in 2002.[15] As a result, the AOI score for high-risk premature births improved 47%, term deliveries 14%, and 16% overall from 2001 to 2004 (Figure 3).

FIGURE 3. Adverse Outcomes Index:
Beth Israel Deaconess Medical Center, 2000-2004

Total, <37 weeks, >37 weeks gestation

An enhanced quality improvement program put in place in 2001, followed by a team training initiative in 2002, helped to create a culture of patient safety at Beth Israel Deaconess Medical Center. That effort has paid off. By 2004, BIDMC saw a 47% drop in the adverse outcomes index among gestations under 37 weeks and a 14% for gestations over 37 weeks. Total improvement for the entire patient population was 16%.

Between 2000 and 2004, WAOS and SI at our institution decreased by about 50%. In contrast, these scores did not change among National Perinatal Information Center hospitals during the same period.

The Beth Israel Deaconess Medical Center malpractice claims, suits, and observations (monies placed in reserves for potential claims) dropped by more than 50% in the period from 2002 to 2005. The money set aside for cases also dropped 50%, a savings of several million dollars. Similarly, the number of high severity claims was reduced by about 50% (Table 2). We believe this teamwork initiative provides a safety net for clinicians without increasing the liability risk. Identifying problems and mitigating errors prevents potentially disastrous outcomes for patients, their families, and providers.

Additional measures such as patient satisfaction tools and use of the Agency for Healthcare Research and Quality staff culture tool can also be used for measurement regarding this initiative.[21]

Unfortunately, the cultural changes needed to improve patient safety sometimes come only after an L&D unit experiences a maternal or neonatal death. But it's this type of disturbing event that can serve as a "burning platform" for reorganizing care to focus on this urgent issue. The purpose of quality assurance is to monitor the care rendered, highlight system failures, and suggest improvements. A teamwork training initiative is one such improvement and changes how obstetrics is practiced, encouraging providers to move out of their individual silos and practice in a more collaborative way.

Developing a culture in which teamwork is practiced on a daily basis provides a safety net that can identify situations in which patients may be at risk and prevent errors from occurring. This type of training doesn't require increased staffing, may help a novice nurse gain expertise more quickly, and has the potential to increase job satisfaction for the more experienced nurse. All these pluses in turn can reduce nursing

TABLE 2

Beth Israel Deaconess Medical Center: Indemnity experience, 38 months pre- and postteam training

	Claims + suits + observations	No. high severity (%)
8/1/1999-7/31/2002 (~15,000 deliveries)	20	11 (55%)
8/1/2002-7/31/2005 (~15,00 deliveries)	11	5 (45%)

Risk Management Foundation of the Harvard Medical Institutions.
*The term observations refers to money put aside for potential claims.

staff turnover.

The financial rewards of such a program can also be substantial. Our captive insurer, the Risk Management Foundation of the Harvard Medical Institutions, offered a 10% reduction in malpractice premiums for physicians who participated in teamwork training and completed online courses. In order to fundamentally change the way we provide care, we would argue that medical liability insurers need to participate in this process by providing such incen-

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tives for changing culture.

Teaching clinicians to behave as *true* teammates will improve staff attitudes and enhance performance of an L&D unit, and that can improve maternal and neonatal outcomes and reduce malpractice

claims. While tort reform has been the specialty's main focus as a remedy for the professional liability crisis, our experience clearly shows teamwork training is an important tool in the prevention of medical errors. □

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