Improving surgery

The surgery morbidity and mortality conference

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As both an educational and quality improvement tool, the surgery morbidity and mortality (M&M) conference is, at its core, an affirmation of the American surgical culture and heritage.[1] However, with increased focus on the systematic underpinnings of medical errors, there is now less emphasis in our M&M on the performance of individuals. This shift away from individual accountability—the surgeon as "crew member" rather than "captain" of the ship—has appropriately identified systemic flaws in our clinical care systems as important determinants of adverse patient outcomes. But has the pendulum swung too far?

Origins of the surgery morbidity and mortality conference

The history of the surgery M&M conference has been summarized previously.[2] Beginning with the end results system of Dr. Ernest A. Codman in Boston at the turn of the twentieth century and the Anesthesia Mortality Committee of the Philadelphia Medical Society in 1935, the M&M conference has evolved to become more educational than punitive, and to focus more on the system components of adverse patient outcomes than on the errors of individuals.[3–5] Evidence has replaced anecdote in the identification of optimal care pathways and protocols. Data from the medical literature combined with the statistical evaluation of local experience can be used to better assess the potential for institutional improvements in patient outcomes resulting from widespread acceptance of literature recommendations.[6]

In my own institution, the University of New Mexico, the surgery M&M conference (officially called the Practice-Based Learning and Improvement Conference) under the leadership of Dr. Cynthia Reyes has become a kinder, more collegial entity than in the past. Attending surgeons now review the presentations of the residents several days before the conference, then provide specific critique of the identified learning points for each case and suggest classic literature references to supply context to the residents' presentations. The conference moderators (a position rotated among interested faculty members) make concerted efforts to maintain a supportive, sensitive, and safe environment for the residents and faculty. If follow-up punitive action could result from issues raised in the conference, that discussion occurs in a confidential setting. The purposes of the conference are education and quality improvement rather than faculty peer review or resident disciplinary action.

But in analyzing adverse medical outcomes, how do we strike the right balance between the performance of individuals and the performance of systems (such as information systems, operating room equipment scheduling and staffing, and procedures)?[5,7] Residents need to learn to recognize the dynamic tension that exists between system and personal accountability for adverse events,[7] but how do we analyze them in a way that respects their dignity and self-worth? Most importantly, how do we ensure that the lessons learned at M&M conferences are integrated into the daily performance of the conference participants? It is worth noting that residents who tend to ascribe adverse patient events to system deficiencies are less likely to report modification of their subsequent clinical behaviors in response to an adverse clinical event.[8]

Current concepts in patient safety

The most critical change to M&M conferences in recent years is the recognition and discussion of the importance of system contributions to patient safety and, conversely, to adverse patient outcomes. James Reason's Swiss cheese model of error has largely replaced the former surgeon-centered model.[9–10] Reason's model posits that, given the right set of human and system circumstances, the "holes" in each layer of error defense (e.g., protocols, procedures, surgeon and support staff training) can align to let an error pass unimpeded through all the layers. Recognizing these latent flaws in our defenses should help us develop better safety protocols and reduce the vulnerabilities in our defenses.

Unfortunately, the interaction of systemic issues such as operating room equipment and procedures with surgeon performance is even more complex than suggested by the Swiss cheese model. These complex and many times unpredictable interactions among people, protocols, and technology are

studied in human factors analysis and ergonomics, but are far from completely understood. Technology, for example, may sometimes increase, rather than decrease, the potential for adverse outcomes, especially if the users of that technology don't fully understand its operations and full functionalities.[9–11]

The analysis of adverse outcomes is, by nature, post-hoc. People strive to do good work and, in the moment and context in which errors occur, apparently illogical actions are generally seen as perfectly logical by the agent.[12] Understanding why actions appeared reasonable at the time is as important as understanding why they were, in retrospect, unreasonable or unwise.

Communication errors in the clinical setting often contribute significantly to adverse outcomes. The high-stress, high-stakes clinical settings of the operating room and the trauma bay have adapted crew resource management training from the commercial airline industry.[13–14] In such a setting, all members of the clinical team must be empowered to speak and be heard when anything less than optimal care and practice are observed, so that potential errors can be identified *before* they occur. If an adverse event does occur in such an environment, it must be more quickly recognized and its effect mitigated. Similarly, greater emphasis is being placed on the technique and documentation of hand-offs of patients among successive health care teams. Each transfer of care holds the potential for information loss. Standardized transfer protocols (e.g., checklists) and the use of information technology to automate the transfer of critical patient information are helping to minimize information loss during transitions in care.[15]

Atul Gawande and others have promoted checklists as critical to reducing adverse surgical outcomes.[16] To once again use an aviation analogy, the use of standard preflight procedures—in the OR, the "time-out" before surgery—have been shown to reduce preventable errors such as wrong-sided surgery, the administration of medications to which the patient is allergic, and the inappropriate timing of perioperative antibiotics. As with pilots who can also turn to checklists to address many in-flight emergencies, the potential for such intraoperative checklists to guide surgeons through emergencies is intriguing. When fully utilized, a 19-item perioperative checklist developed by the World Health Organization has been shown to reduce surgical complications and deaths in hospitals in the United States and abroad.[17]

However, even with a "perfect" surgical system of standardized protocols, seamless communication, and ideal clinical support systems, adverse surgical outcomes will still occur. A recent paper by Peter Fabri and José Zayas-Castro of the University of South Florida College of Medicine questions the whether system deficiencies, as opposed to human errors, are the prime driver of adverse surgical outcomes.[18] They analyzed more than 9,000 surgical procedures, with a complication rate of 3.4 percent and 78.3 percent of complications

related to a medical error. Among the cases with errors, the ratio of errors classified as "slips" (doing the right thing incorrectly, usually during execution) to errors classified as "mistakes" (doing the wrong thing, generally during patient evaluation) was about three to one. The most frequent errors were "errors in technique" (63.5 percent), followed by errors in judgment, inattention to detail, and incomplete understanding of the problem. System errors (2 percent) and communication errors (2 percent) were infrequently reported as factors contributing to surgical complications.

Improving surgeon performance

Improving the safety of surgery must include high-quality, evidence-based clinical protocols, user-friendly clinical information systems (including decision-support systems), well-functioning (and communicating) clinical teams, surgical checklists, and ergonomically-appropriate and well understood surgical equipment that makes the physical work of surgery easier and safer. However, in the end, the responsibility for the preoperative medical evaluation of the patient, the selection of a specific operative intervention, the conduct of the surgery, and the oversight of postoperative care all rest with the surgeon. Surgeon performance inevitably is the major determinant of both good and bad patient outcomes.

What can help surgeons improve the safety of surgery?

• Didactic education is important, but generally occurs before or after the fact, and the improvements may not be enduring.

• Peer review is too often punitive rather than supportive.

• The reflective self-review of clinical outcomes is beneficial, especially when outcomes are benchmarked against institutional and national standards. However, unless it is tied to specific corrective action plans and shared documentation, such self-review may not provide sustained improvement for the individual surgeon or for other surgeons committing the same errors or working within the same error-prone system.

• While the multiple checklists used in commercial aviation to guide the response of pilots and co-pilots to in-flight emergencies might seem theoretically ideal for the operative setting, they are difficult to design and implement in operating rooms shared by multiple surgeons doing many different kinds of surgical procedures. Nevertheless, we hope that our careful supervision of surgical trainees helps them to internalize these types of surgical emergency checklists.

• The value of simulation training is well-accepted in surgery for the acquisition of specific technical skills. However, per the sports maxim: practice does not make perfect; it only makes permanent. Only perfect practice makes perfect performance. Repetition with appropriate guidance and feedback is necessary to improve technical, communication, and evaluative skills.

• Surgeon performance in the resuscitation bay and the operating room are important determinants of patient

outcomes. Ideally, high-fidelity trauma bay and operating room simulations should reproduce the personal stress associated with such settings, and include education on techniques for intraoperative stress management.[19] To paraphrase the classic 1970s medical novel, *The House of God*: in a cardiac arrest, take your own pulse first.[20] The ability to maintain calm, focused activity in the face of an unexpected disaster is a gift few are born with, but one that is critical to surgical disaster-management. Operative team function (e.g., crew resource management) is critical, but only succeeds with a surgeon who is in emotional control. Ideally, this paradigm is consistently role-modeled for trainees by the supervising attending surgeon. It is encouraging to note, however, that these focused problem-solving and personal stress-management skills are readily teachable, and can be explicitly learned through focused simulation exercises.[19]

Closing the loop

The M&M should be regarded by all concerned—students, residents and faculty—as a diagnostic tool to identify and develop both systemic and individual quality improvement plans. If system factors predominate in a specific adverse outcome, that information must be conveyed to the individuals within our institutions who are responsible for maintaining those systems. If individual performance deficiencies predominate, targeted reading assignments with follow-up examinations (written and oral) that focus on clinical problem-solving and mandated participation in individual or group simulation activities, including crew resource management and personal stress-reduction exercises, can be implemented.

In acknowledging the importance of system deficits we must not ignore personal accountability. Flawed surgical decision-making, poorly-applied or inadequate medical knowledge, incomplete medical risk assessment, and the imperfect application of surgical technique to a specific patient remain central to most adverse surgical outcomes.

The overarching goal of the surgery M&M conference, and of all our educational and clinical quality improvement activities, should be to improve the clinical performance of surgeons and to enhance the safety and efficiency of the environment in which they practice. Our trainees and our patients deserve no less.

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