Surgeons' Non-technical Skills

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• Assessment

Over the last decade or so there has been increasing recognition that adverse events in health care, and specifically surgery, are more likely to originate from behavioral failures than a lack of technical expertise.[1,2] Analysis of worldwide literature suggests that as many as 10% to 15% of patients admitted to hospital experience an adverse event not directly related to their underlying condition, around 50% of which are classified as avoidable. Most of those patients are surgical,[3] and studies indicate that approximately half of all adverse events occur in the operating room (OR).[4] Much of the background information on these adverse events is covered elsewhere in this issue.

The recognition of the enormity of the scale of the problem worldwide led to the introduction of the World Health Organization (WHO) surgical checklist,[5] which showed a significant reduction in mortality and morbidity in a large multicountry study. A follow-up study performed in already high-performing hospitals in the Netherlands[6] confirmed the benefits of this checklist. However, data from the United States in relation to the persisting errors that still occurred after the adoption of the universal protocol[7] suggest that the checklist itself is not the panacea for avoiding adverse events, even if it does help to reduce them. This situation is undoubtedly because the checklist works, not just by providing a tick-box reminder of specific points but by having the underlying ability to focus the team on the job in hand and address some of the human factor issues around patient safety. If these issues are not understood then the full value of the checklist is lost.

These findings all support the argument that although technical skills are necessary for safe surgery, taken in isolation they are not sufficient to maintain high levels of performance over time. In addition, what are now commonly termed non-technical skills,[8] are as important, and sometimes more important, in ensuring the optimum outcome for the patient undergoing surgery. The problem within medicine in general,

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and surgery in particular, is that these non-technical skills have never been formally recognized, taught, or assessed. However, in the past decade several studies have revealed that surgeons believe that these skills are essential for safe performance and that they have also been found to be lacking in instances of adverse events for surgical patients. For example, in a reply to an anonymous postal survey, 68 consultant surgeons from all specialties in southeast Scotland identified 70 separate skills that they considered important in a successful surgical trainee.[9] Of these skills, only 19 (27%) were technical and 22 (31%) clinical, with 29 (41%) related to communication, teamwork, and application of knowledge. Communication was also identified as an important causal factor in 43% of errors made in surgery in a study performed in North America in 2003.[10] Other studies have indicated that teamwork[11] and decision making[12] have been lacking in instances of surgical failure.

Analysis of adverse events and accidents in other high-risk industries, such as civil aviation, offshore oil exploration, and nuclear power generation, have resulted in the development of training and assessment in non-technical skills. This training is more commonly called crew resource management training, for which behavior rating systems have been developed to assess these non-technical skills in a more formal manner in the workplace. One such example is the NOTECHS (Non-technical Skills for Pilots) system,[13] which comprises categories and elements of non-technical skills and is used to observe and rate pilots' behavior in the cockpit during both simulated and real flight. Although there is continuing debate about the relevance of adopting methods of aviation safety to improve health care safety,[14,15] the approach of developing specific behavior rating systems for use in the OR seems to be a sound one; several such systems now exist and these are discussed in the following section.

BEHAVIORAL MARKER SYSTEMS

Behavioral marker systems such as NOTECHS are methods to identify behaviors that contribute to superior or substandard performance based on a taxonomy of skills. A rating scale is also used in conjunction with the taxonomy. These marker systems are context-specific and must be developed for the situation in which they are to be used. For example, the NOTECHS system was developed and evaluated with subject matter experts from civil aviation.[16] If a high level of validity is required, it is no use taking behavior marker systems developed to assess pilots, scoring out "pilots", inserting "surgeons", and then expecting that these systems are appropriate to assess surgeons. For effective non-technical skills assessment, the system needs to be explicit, transparent, reliable, and valid for the domain in which it is being used.

Observational methods of improving safety in medicine were originally pioneered in anesthesia.[17] More recently, other observational studies have identified the individual, team, and organizational factors that seem to underlie surgical performance.[18–22] These observational systems have been used to drive development and adaption of behavioral rating tools in surgery such as:

1. OTAS (Objective Teamwork Assessment System)[23,24]: a teamwork assessment tool for 3 subteams based on a theoretic model of teamwork[25]
2. Oxford NOTECHS[26]: amended aviation tool for rating surgeons
3. Surgical NOTECHS[27]: amended aviation tool for rating surgical teams
4. NOTSS (Non-Technical Skills for Surgeons)[28]: de novo development with subject matter experts (surgeons) to observe and rate individual surgeons.

These tools all differ on how they were developed, for whom they were developed, the level of analysis used, and for what purpose. The following section describes the