

## Error and surgery: Can we do better?

John M.A. Bohnen, MD;\* Lorelei Lingard, PhD†

When asked if he practised safe sex, a patient of ours replied: “Do you practise safe surgery?” Most practitioners realize now that the patient’s question is valid. What should surgeons do to enhance the quality of medical care they provide and guard their patients from injury?

Safety from iatrogenic harm is one element of the quality of patient care. Experts generally consider health care quality in several domains that sometimes pull against one another; for example, we could spend greater resources on patient safety to the detriment of innovation or accessibility. Many descriptions of the multiple domains of quality are available, such as that in the recent book *Crossing the Quality Chasm*, published by the Institute of Medicine, an American think tank.<sup>1</sup> That book characterizes high-quality care as safe, effective, patient-centred, timely, efficient and equitable. Safety is stated first in that definition, but do we actually put safety first as do industries such as commercial aviation?

Health care providers work in an array of systems that seem designed to thwart our attempts to administer high-quality care to individual patients and populations. We are handicapped by inadequate resources to meet needs, inconsistent goals among providers, inadequate information systems and a lack of knowledge of improvement methods. In a

seminal editorial in the *New England Journal of Medicine* in 1989, Donald Berwick challenged health care leaders and providers to explore methods of quality improvement that have been used in business and engineering for decades.<sup>2</sup> Improvement science draws on the methods of J. Edwards Deming, who explained that problems of quality usually reside in complex processes not in individual workers. Much as evidence-based medicine is built on inferential statistics, Deming and his followers have used the mathematical constructs of statistical process control to implement control charts, process flow diagrams and other tools to improve measurably the quality of manufactured products and other goods and services. The economic recovery of postwar Japan has been attributed to Deming’s methods more than any other factor.

Whether improvement science can straighten out health care is debated, and the idea of importing it into our work is relatively new. In the last 5 years, however, discussion and debate around quality of health care have accelerated and achieved greater focus because of a rapidly growing awareness that problems of quality are not just causing inconvenience and delays, they are injuring and killing patients. Two important publications, both generated by the United States government-sponsored Institute of

Medicine, have defined and described widespread problems of medical error in the US.<sup>3,4</sup> The first, by Chassin and Galvin,<sup>3</sup> lists causes of poor quality in American health care, argues that payment method is not the most important issue and explains that quality of care is measurable. The Institute of Medicine’s book, *To Err Is Human*, has galvanized medical leadership and practitioners worldwide because of its comprehensive treatment of medical error by authoritative leaders in the field, and because of the intense media interest it has generated. By exploring the science of error that other industries have developed and applying it to problems we encounter in clinical practice, this book has familiarized us with the concept that making mistakes is part of human nature. We must develop systems to error-proof our work, as aviation and other “high reliability” industries have done more successfully.

Most publications on medical error refer to data from the Harvard Medical Practice (HMP) Study,<sup>5</sup> the first large-scale effort to quantitate the incidence of medical error. The HMP Study found, retrospectively, a 4% incidence of adverse consequences of care in a study of more than 30 000 hospitalized patients. Over half the adverse events were considered due to errors. Experts have extrapolated the HMP Study data to estimate that 100 000 patients die from

\*Division of General Surgery; Medical Director, Health Care Improvement Unit, St. Michael’s Hospital; Director of Postgraduate Surgical Education, University of Toronto, Toronto, Ont.

†Centre for Research in Education, Department of Pediatrics, University of Toronto, Toronto, Ont.

Correspondence to: Dr. John M.A. Bohnen, Division of General Surgery, St. Michael’s Hospital, 30 Bond St., Toronto ON M5B 1W8; fax 416 864-3049

medical error in the US annually. Although these figures have been debated, similar publications in other parts of the US, Australia and elsewhere have shown that medical error is widespread.<sup>6,7</sup> As expected, many adverse events and errors occur in surgical practice. A prospective study of a general surgery service in a Canadian teaching hospital found that of complications in and outside the operating room, 18% were attributed to possible error.<sup>8</sup>

There is little published literature on proven methods to prevent surgical error, in contrast to anesthesia, which is the leader among medical specialties in error prevention strategies.<sup>9</sup> Successes in surgical practice have included reductions in errors of preoperative antibiotic prophylaxis<sup>10</sup> and in trauma care secondary to the benefits of regionalization.<sup>11</sup> Incorporation of error reduction systems in the operating room has not become widespread surgical practice, although institutional efforts to prevent wrong-side and wrong-site operations are a start.<sup>12-14</sup>

In the absence of generally accepted systems for error reduction, what should surgeons and surgical residents do now in their practices to reduce and mitigate the effects of error? Surgeons and trainees must learn, practise, communicate, teach, investigate and organize to bring error management into the culture of surgical practice.

Learning the basics of error science can be achieved by reading sources such as *Clinical Risk Management*,<sup>9</sup> *To Err Is Human*,<sup>4</sup> and an increasing number of journal articles on the subject. Clinicians should attend educational offerings such as the Royal College of Physicians and Surgeons of Canada annual meetings, which focused on patient safety in 2001 and 2002. Learning will be advanced by testing error reduction strategies to see what works; when accompanied by measurement, this strategy of small incremental "tests of change" is one of the bases for

quality improvement. Increasing personal awareness and knowledge through education is a critical strategy toward error management — from it, the rest will follow.

Surgeons must attempt to practise safe surgery wherever possible. For example, marking the proper side before a limb operation should become standard practice. Education, self-reflection, informal discussion, data collection and discussion of adverse outcomes at morbidity and mortality (M and M) rounds will inform and guide safe practice. M and M rounds should cast a broad net to include all significant complications of care, which should be detailed verbally and discreetly to maintain confidentiality and freedom of expression. Written records should count the incidences of particular complications. Nonmedical team members should be included when appropriate to join in addressing latent system failures that have led to unintended outcomes. Leaders should not intimidate or blame subordinates. M and M rounds should generate ideas for system improvements.<sup>15</sup>

Surgeons and other providers who work in the operating room must improve how they communicate interprofessionally in delivering patient care. Recent research suggests that ineffective or insufficient communication among team members contributes to medical error in the operating room.<sup>16</sup> Team members have cited improved communication as a requirement for improved operating room safety.<sup>17</sup> Ethnographic research has described recurrent catalysts for tension that impair transfer of information in the operating room.<sup>18</sup> Further, this research has revealed that information transfer among members of the operating room team is often a nonstandardized, noninclusive and nonintegrated process. By this we mean that information transfer does not follow a predictable format but varies from case to case and team to team; information transfer does not include reliably all relevant

members of the team; and information transfer is not integrated formally as a series of steps with a logical position in the surgical procedure. Before every commercial airline flight, pilots and crew go through a checklist together to cover what might go wrong. Should we not do this in the operating room before each procedure? Surgeons should pay attention to how their teams share information, try to modify the impact of tension on their communication practices and promote effective communication in and outside the operating room as a safety measure.

Surgeon educators, including residents, must teach about unintended outcomes of care in and outside the operating room through informal discussions and didactic sessions. Most surgical faculty members have developed the requisite expertise through participation in M and M rounds, as medicolegal consultants, as assessors for provincial colleges and in setting standards for the Royal College.

Surgeon leaders have the capacity to commandeer and organize resources toward improved patient safety, and increasingly they will be held accountable for implementing error reduction strategies. They must accomplish this by serving as role models, promoting research and education in error and patient safety, hiring for special expertise, and working with hospital administrations to support safe practice. Governments, communications media, public interest groups, payers, consumers and providers of care want to work in a system in which patient safety has become part of the daily culture. We will accomplish that goal if we develop awareness and act now on the need to do right by our patients.

## References

1. Institute of Medicine. *Crossing the quality chasm. A new health system for the 21st century*. Washington: National Academy Press; 2001.

2. Berwick DM. Continuous improvement as an ideal in health care [review]. *N Engl J Med* 1989;320:53-6.
3. Chassin MR, Galvin RW. The urgent need to improve health care quality. Institute of Medicine National Roundtable on Health Care Quality. *JAMA* 1998;280:1000-5.
4. Kohn LT, Corrigan MM, Donaldson MS, editors. *To err is human: building a safer health system*. Washington: National Academy Press; 2000.
5. Leape LL, Brennan TA, Laird N, Lawthers AG, Localio AR, Barnes BA, et al. The nature of adverse events in hospitalized patients. Results of the Harvard Medical Practice Study II. *N Engl J Med* 1991;324:377-84.
6. Thomas EJ, Studdert DM, Burstin HR, Orav EJ, Zeena T, Williams EJ, et al. Incidence and types of adverse events and negligent care in Utah and Colorado. *Med Care* 1999;38:261-71.
7. Wilson RM, Harrison GB, Gibberd RW, Hamilton JD. An analysis of the causes of adverse events from the Quality in Australian Health Care Study. *Med J Aust* 1999;170:411-5.
8. Wanzel KR, Jamieson CG, Bohnen JM. Complications on a general surgery service: incidence and reporting. *Can J Surg* 2000;43:113-7.
9. Vincent C, editor. *Clinical risk management*. 2nd ed. London (UK): BMJ Books; 2001.
10. Evans RS, Pestotnik SL, Classen DC, Clemmer TP, Weaver LK, Orme JF, et al. A computer-assisted management program for antibiotics and other anti-infective agents. *N Engl J Med* 1998;338:232-8.
11. Shackford SR, Hollingworth-Fridlund P, Cooper GF, Eastman AB. The effect of regionalization upon the quality of trauma care as assessed by concurrent audit before and after institution of a trauma system. *J Trauma* 1986;9:812-20.
12. Meakins JL. Site and side of surgery: getting it right [editorial]. *Can J Surg* 2003;46:85-7.
13. Gross M. Managing risks: a surgeon's perspective [editorial]. *Can J Surg* 2003;46:90-1.
14. Bernstein M. Wrong-side surgery: systems for prevention [published erratum appears in *Can J Surg* 2003;46:225]. *Can J Surg* 2003;46:144-6.
15. Orlander JD, Barber TW, Fincke BG. The morbidity and mortality conference: the delicate nature of learning from error. *Acad Med* 2002;77:1001-6.
16. Helmreich RL. On error management: lessons from aviation. *BMJ* 2000;320:781-5.
17. Helmreich RL, Davies JM. Team performance in the operating room. In: Bogner MS, editor. *Human error in medicine*. Hillsdale (NJ): Erlbaum; 1994. p. 225-53.
18. Lingard L, Reznick R, Espin S, DeVito I, Regehr G. Team communications in the operating room: talk patterns, sites of tension and implications for novices. *Acad Med* 2002;77:37-42.

Canadian Journal of Surgery  
Journal canadien de chirurgie

## Change of address

We require 6 to 8 weeks' notice to ensure uninterrupted service. Please send your current mailing label, new address and the effective date of change to:

### CMA Member Service Centre

1867 Alta Vista Dr.  
Ottawa ON K1G 3Y6

tel 888 855-2555 or  
613 731-8610 x2307  
fax 613 236-8864  
cmamsc@cma.ca

## Changement d'adresse

Il nous faut de 6 à 8 semaines d'avis afin de vous assurer une livraison ininterrompue. Veuillez faire parvenir votre étiquette d'adresse actuelle, votre nouvelle adresse et la date de la prise d'effet du changement, à l'attention du

### Centre des services aux membres de l'AMC

1867, prom. Alta Vista  
Ottawa ON K1G 3Y6

tél 888 855-2555 ou  
613 731-8610 x2307  
fax 613 236-8864  
cmamsc@cma.ca

ASSOCIATION  
MÉDICALE  
CANADIENNE



CANADIAN  
MEDICAL  
ASSOCIATION