

Measuring Perioperative Mortality

The Key to Improvement

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JOHN Snow was one of the founding fathers of anesthesia in the late nineteenth century and a pioneering epidemiologist. He recorded the details of more than 5,000 anesthetics during more than 12 yr of practice and stressed the importance of accurate drug administration and patient monitoring.¹ In 1949, Mackintosh² published an analysis of anesthetic deaths and discussed common lessons learned, such as safe positioning of unconscious patients, the appropriate use of thiopentone, and the dangers of cylinder misconnections. He encouraged the investigation of perioperative deaths as a means to improve anesthesia safety. In the modern era, Lunn and Devlin³ worked together as anesthesiologist and surgeon to examine the whole patient journey, recognizing that factors in anesthesia, surgery, and perioperative care required consideration if improvements in outcomes were to be made. Eichorn⁴ gathered data that supported mandatory standards for anesthetic monitoring, the basis of the American Society of Anesthesiologists standards and guidelines today.⁵ A recent meta-analysis and systematic review of perioperative mortality and anesthesia-related deaths shows the positive impact of safety interventions over the past 80 yr.⁶ However, this article also suggests that improvements have not been matched in poorer parts of the world. Indeed, in countries with a low human development index (defined by life expectancy, education, and per capita income indicators), anesthesia mortality has remained unchanged since the 1950s.⁷ It is particularly refreshing therefore to read the work of Sileshi *et al.*⁸ in this edition of *ANESTHESIOLOGY* and their demonstration that it is possible to gather high-quality outcome data to improve anesthesia services in a middle-income country.

Sileshi *et al.*⁸ developed a data collection tool to prospectively monitor perioperative mortality rate in a tertiary nongovernmental referral hospital in Kenya. They recorded



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24-h, 48-h, and 7-day mortality, as well as case-specific perioperative data including type of surgery and anesthesia, American Society of Anesthesiologists status, and use of essential monitors and the World Health Organization Surgical Safety Checklist. The team at Kijabe recorded a lower perioperative mortality compared with other studies in low- and middle-income countries, and, importantly, they recorded an improvement in outcomes over the study period.

Few anesthesia- and surgery-related deaths actually occur in the operating room. Although harm may start there, death often takes place on the ward or intensive care unit some days later. Timing of data collection is therefore important. Early (immediate) deaths within 24 h will describe those dying of overwhelming illness, anaphylaxis, total spinal, airway disaster, or cardiac arrest; later follow-up will detect those who were initially resuscitated from a catastrophic event and those developing multiorgan failure from sepsis, aspiration, and so forth. Data collection and follow-up of patients in a resource-constrained system are extremely difficult and therefore the measurement needs to be practical. Sileshi *et al.*⁸ are to be congratulated on their use of innovative methods to solve these challenges in data collection. The authors trained anesthesia providers to collect data electronically, which provided better returns than a traditional paper-based system. The system was designed to allow intermittent data upload to cope with irregular Internet connectivity. The authors found it difficult to capture 7-day follow-up, but since mobile phone technology is almost universal in Kenya, they used a local research officer to capture the 7-day information by phone.

The hospital in Kijabe has pioneered the development nurse anesthesia training in Kenya and has developed a model of task sharing between physician and nurse providers. Their outcomes are likely to be due in part to external funding and

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local leadership, which is reflected in near-universal availability and use of essential monitors. There is also an impressive safety culture in the hospital, demonstrated by the use of the World Health Organization checklist in 99.4% of cases. Perioperative mortality was higher in emergency cases and, in general, neurosurgical and orthopedic surgery compared with obstetric surgery. Tantalizingly, outcomes improved over the course of the study, suggesting that a simple focus on quality and data collection was in itself a driver to improvement. The team at Kijabe has shown that it is feasible to collect reliable perioperative mortality rate data in a developing country; the next challenge will be to see whether this program can be sustained and rolled out to other centers.

Until recently, surgery has been almost absent on the global stage, described as the “neglected stepchild of global health.”⁹ However, there are welcome signs that things are changing. The third Disease Control Priorities publication from the World Bank Essential Surgery¹⁰ described the central role of surgery as part of universal health coverage and the cost-effectiveness of surgery at the district hospital level. Member states attending the sixty-eighth World Health Assembly in 2015 made a historic commitment to strengthen emergency and essential surgical care and anesthesia as part of universal health coverage by 2030.^{11,12} Access to basic safe surgical care remains a huge challenge for many countries. The Lancet Commission on Global Surgery¹³ described the scale of the problem. Currently, five billion people do not have access to safe, affordable surgical care when needed. The greatest unmet need is in Sub-Saharan Africa and South Asia, where nine out of ten people do not have access to safe surgery.¹³ Strengthening surgery and anesthesia at the district hospital by improving capacity to deliver three bellwether procedures (laparotomy, cesarean delivery, and open fracture) has the potential to improve outcomes for millions of patients. Without significant investment in surgery, low- and middle-income countries face an estimated cumulative loss of productivity of \$12.3 trillion between 2015 and 2030.¹³

Modern anesthesia has developed into a highly complex clinical specialty, and the challenge to improve services in poorer parts of the world is enormous. The work started by John Snow and other pioneers in anesthesia has demonstrated the importance of recording and reviewing perioperative mortality, and the Lancet Commission has recommended that these data be collected routinely.¹³ Sileshi *et al.*⁸ have shown that it is possible to monitor routine anesthesia care delivery and perioperative mortality and demonstrate the positive impact on investments made. The next step will be to translate these data into the mantra of “lives saved” and to bring policy makers and donors engaged in other areas of healthcare development into the operating room.

Competing Interests

Dr. Walker is a foundation trustee of the Association of Anaesthetists of Great Britain and Ireland (London, United Kingdom) and trustee of the Lifebox Foundation (London, United Kingdom). Dr. Wilson is a trustee of the Lifebox Foundation and was an author of the Lancet Commission on Global Surgery (London, United Kingdom).

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