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Has anesthesia care become safer and is anesthesia-related mortality decreasing?

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Abstract

In well-resourced areas of the world anesthesia has become safer over the past decades, and anesthesia mortality does seem to be reducing. However, there is a lack of international agreement over definitions of anesthetic mortality and, therefore, difficulty in knowing exactly what the rate of anesthetic mortality is. Avoidable harm from error is still a problem, and sophisticated analysis suggests that more deaths than generally appreciated may be attributable to factors under the control of anesthetists. Mortality rates in low income areas of the world are unacceptably high. There is more to be done if anesthesia is to become truly safe for all patients.

Introduction and context

It is widely believed that the rate of mortality associated with anesthesia is steadily decreasing, and that anesthesia today is very safe indeed [1]. However, this assertion has been questioned by Lagasse [2], who argues that the definitions of anesthetic mortality used in different studies over the years have not been consistent.

Recent advances

Perhaps the best data on anesthesia mortality come from Australia, where the state-based Anesthetic Mortality Review Committees have followed a relatively consistent approach with clear definitions (Table 1) for 20 years [3,4]. Case mix clearly makes a substantial difference to the risk of anesthesia, but the sequential triennial reports of these committees do suggest that anesthesia has become safer over time and that the risk of death definitely and entirely attributable to anesthesia today is close to 1 in 200,000 in patients who are essentially healthy and undergoing minor or moderate surgical procedures. It is disappointing, however, that even these data relate primarily to deaths within either 24 or 48 hours of anesthesia, whereas most people would probably be more interested in knowing their chances of actually going home from hospital and surviving for a

reasonable period thereafter (30 days post-surgery, for example). There is very little information on this, although at least one European study suggests that these risks may be much higher than generally appreciated [5]. This European study also confirms earlier evidence [6,7] suggesting that anesthesia makes an important contribution to outcome after surgery.

Fundamental to any discussion of the safety of anesthesia is the matter of when mortality should be attributed to anesthesia. The Australian Mortality Committees have provided definitions by which perioperative deaths can be attributed to one of eight categories, three of which relate to anesthesia (Table 1) [4]. The critical words are: "...caused by the anesthesia or other factors under the control of the anesthetist." It is these other factors that have largely been overlooked in efforts to estimate the true incidence of mortality (let alone morbidity) attributable to anesthesia.

Perioperative myocardial ischemia is a case in point [8]: clearly it may be attributable or amenable to factors under the control of the anesthetist; its consequences often manifest several days postoperatively [8] so are easily overlooked, particularly in studies that focus on

Table 1. Definitions of categories of death attributable to anesthesia used by Australian Anesthesia Mortality Committees [4]

Category 1	Where it is reasonably certain that death or morbidity was caused by the anesthesia or other factors under the control of the anesthetist
Category 2	Where there is some doubt whether death or morbidity was entirely attributable to the anesthesia or other factors under the control of the anesthetist
Category 3	Where death or morbidity was caused by both medical/surgical and anesthesia factors

the first 24 or 48 hours after surgery; and it may contribute to death, although often only some time later. In a study by the Study of Perioperative Ischemia Research Group, patients surviving a postoperative in-hospital myocardial infarction had a 28-fold increase in the rate of subsequent cardiac complications within 6 months following surgery, a 15-fold increase within 1 year, and a 14-fold increase within 2 years [9]. Are these extra deaths attributable to anesthesia? We would argue that they are. In the Perioperative Ischemic Evaluation (POISE) study [10], a multicentre prospective blinded controlled trial involving 8,351 patients, the incidence of perioperative myocardial infarction in patients randomized to receive metoprolol was 4.2% compared with 5.7% in those receiving placebo (confirming the value of beta-blockers in protecting the heart), but the overall mortality was 3.1% and 2.3%, respectively. In other words, the perioperative use of beta-adrenergic blocking drugs, a factor very much under the control of anesthetists, was associated with an excess mortality rate of 0.8%. The wider question of how and when to use beta-blockers during anesthesia, and of the other factors relevant to optimal management, is of course complex [10], which is exactly why anesthetists are rebranding themselves as experts in perioperative medicine. However, one cannot have it both ways: the fact that the overall management of patients perioperatively can make a substantial difference to outcome is strong endorsement of the argument for a central role for well-resourced medically qualified practitioners in the provision of anesthesia, but it also makes a nonsense out of blanket claims that the risk of dying from an anesthetic is very low.

There are many parts of the world in which anesthesia mortality rates are many multiples of those in high income countries such as the USA, Europe, and Australia [11-13]. Clearly, many advances that have been made in the safety of anesthesia have not been realized everywhere. Even worse, many patients do not receive desperately needed surgical and anesthetic services at all. The number of surgical operations undertaken around the world every year has only recently been

estimated, and, at about 234 million, actually exceeds the number of births [14]. Unfortunately, these operations are very unevenly distributed, with only 3.5% being undertaken amongst those 34.8% of the global population who live in countries spending \$100 or less per person on healthcare. It seems that about 11% of the global burden of disease measured in disability-adjusted life years arises from conditions amenable to surgery [15], so access to appropriate surgery is clearly essential, and obviously depends on equal access to safe anesthesia. Even in high income countries there is substantial variance in access to services: more disturbingly, there is astonishing variance in practices over and above the variance attributable to resource differences [16]. Furthermore, there is ongoing evidence that even those patients who actually do receive appropriate healthcare (including surgery and anesthesia) are at unacceptable risk of harm from avoidable errors [17-20].

Implications for clinical practice

The Safe Surgery Saves Lives initiative [21] of the World Health Organization has developed a surgical safety checklist to address some of these errors through a cost-effective tool applicable to surgery and anesthesia everywhere. In a study undertaken in eight pilot sites around the world, introduction of this checklist significantly and substantially reduced harm associated with surgery [22]. The pilot study was not a randomized controlled trial, but it was prospective and large (data from almost 4,000 patients collected at baseline were compared with data from a similar number after the introduction of the checklist). This checklist is now being widely adopted around the world. It will not eliminate errors, but it is highly likely to reduce them and, through enhanced teamwork, to improve outcomes more generally. There is now a considerable onus on senior clinicians to promote the use of the checklist in a meaningful manner involving the engaged participation of all members of the operative team. There is also considerable onus on the organizations associated with anesthesia to continue to support initiatives to improve the training and resources available for anesthesia in resource-limited regions of the world. The World Federation of Societies of Anaesthesiologists has provided strong leadership in this regard [23] and in recent years the support for anesthesia from the World Health Organization has increased considerably [24].

As with so many things, the sophistication and accuracy of the way in which we measure outcome has increased in parallel with other advances in anesthesia. This has the effect of highlighting risks of anesthesia that, in previous years, may not have been appreciated at all. So is anesthesia becoming safer? Certainly – and this is self

evident to anyone who has practiced for more than three decades. Is it safe enough? Certainly not, especially in higher-risk patients, and in low-income regions of the world. We are making commendable progress, but there is a long way to go to achieve the goal that “no patient shall be harmed by anaesthesia” [1,25].

Abbreviation

POISE, Perioperative Ischemic Evaluation.

Competing interests

The authors have financial interests in Safer Sleep LLC, which produces a system to promote safety in anaesthesia.

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