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Perioperative Mortality (Review of Literature)

Aly Daabiss M

Department of Allied Health Sciences, Lecturer of Anesthesiology, Faculty of Allied Health Sciences, Pharos University, Alexandria, Egypt

***Corresponding author:** Mohamed Aly Daabiss, Department of Allied Health Sciences, Lecturer of Anesthesiology, Faculty of Allied Health Sciences, Pharos University, Alexandria, Egypt, Tel: +201001661015, E-mail: Mohamed.daabiss@pua.edu.eg

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1. Abstract

Perioperative mortality has been defined as any death, occurring within 30 days after surgery in or out of the hospital. Operative mortality rates are of great interest to surgeons, patients, policy makers, and payers as a universal metric for quality assessment. The rate of perioperative deaths is a measure of the success of surgical care systems and improving this metric is a global priority.

2. Keywords: Perioperative; Mortality; Anesthesia, Surgery

3. Introduction

Over 312.9 million surgical procedures are performed annually world wide[1,2]. However, 4.2 million people are estimated to die within 30 days of surgery each year[3]. A published study in 2010 went over 3.7 million surgical procedures at 102 hospitals in the Netherlands during 1991-2005 and stated that postoperative mortality from all causes was observed in 67,879 patients, for an overall rate of 1.85%[4].

Surgeons and anesthesiologists use various methods in assessing optimal patient's condition from a medical perspective prior to under taking surgery. ASA score is the most widely known of these. The purpose of the ASA patient score is to communicate the risk of under going any procedure that requires anesthesia, with respect to the patient's underlying systemic illnesses to help inform providers about perioperative procedural risks of morbidity and mortality[5]. The decision to carry out any surgical procedure is to weigh the benefits against the risks.

Perioperative mortality may not reflect poor performance but could be attributable to complications from the operation (such as bleeding, sepsis, and failure of vital organs) or pre-existing medical conditions. Other significant predictors of perioperative mortality include age (with neonates, infants, and older patients at a greater mortality risk), and emergency, cardiac or vascular surgeries, and multiple surgeries[3]. Cardiac surgery had a perioperative mortality risk factor that was 42-fold higher than noncardiac surgeries in patients younger than 18 years old[6]. From the medico-legal point of view, both injury and/or disease(s) have to be considered as principal and proximate cause of death, or predominantly procedural in nature [7].

Globally, few studies have compared perioperative mortality across different health systems. A study of 10,745 adult patients scheduled for emergency abdominal surgery from 357 centers across 58 countries observed that mortality is three times higher in low-compared with High-human Development Index (HDI) countries even when adjusted for prognostic factors[8]. In this study the global mortality rate was 1·6 % at 24 hours (high HDI 1·1 %, middle HDI 1·9 %, low HDI 3·4 %), increasing to 5·4 % by 30 days (high HDI 4·5 %, middle HDI 6·0 %, low HDI 8·6 %).

They also reported that out of 1,409 children undergoing emergency abdominal surgery from 253 centers across 43 countries, adjusted mortality in children following surgery may be as high as 7 times greater in low-HDI and middle-HDI countries compared with high-HDI countries[9]. A study based on the previous data stated that 4.2 million people die within 30 days of surgery every year, with half of these deaths occurring in low-and middle-income countries[8,9]. For this reason total global perioperative mortality can only be estimated.

Deaths due to anesthetic errors seem to be less frequent than those caused by surgical or invasive procedure but usually with worsen-

ing consequences. Contributing effect of anesthesia to death generally varies to 1:1700–1:10,000 operations[10].

Critical areas of anesthesia-related mortality are airway management difficulties and cardio circulatory disorders, some related to anesthetic drugs, malfunction of anesthesia-related equipment or more commonly, human error[11] while others occur as a consequence of aging synergistically and preexisting pathological condition, which requires a carefully investigation and evaluation for professional health care responsibility.

Boet et al reviewed the perioperative anesthesia interventions and their potential impact on patient mortality, Among the 15 themes of anesthesia-related interventions identified, only 7 themes demonstrated a significant impact on mortality: pharmacotherapy, nutrition, transfusion, glucose control, device, dialysis, and ventilation[12].

Studies suggest that mortality is higher during general anesthesia than during neuraxial anesthesia[13]. However, this may reflect the fact that patients with hemodynamic instability and a wider variety of more complex cases are surgically treated under general anesthesia. Such cases may include cardiac, thoracic, and neurological operators. Likewise, there may be a bias towards general anesthesia in emergency settings or for patients with coexisting medical conditions. Improved awareness of neuraxial blocks and the use of new and safer local anesthetics for the cardiovascular and central nervous systems, together with routinely used hemodynamic monitoring, have all decreased the frequency of major complications during neuraxial anesthesia[14].

On the other hand, mortality rates significantly reduced during plexus block. Because there are no major respiratory and cardiovascular changes, as well as the introduction of newer local anesthetics with low myocardial toxicity[13].

A study reviewed 599,548 surgical procedures at 10 hospitals in the United States between 1948–1952 and reported that 384 deaths were referred to anesthesia, for an overall mortality rate of 0.064%[15]. In 1984, after highlighting anesthesia mishaps aired in the United States, American anesthesiologist Ellison C. Pierce appointed a committee called the Anesthesia Patient Safety and Risk Management Committee of the American Society of Anesthesiologists[16]. This committee was assigned with determining and reducing the causes of peri-anesthetic morbidity and mortality.

Consequently, the Anesthesia Patient Safety Foundation was created in 1985 as an independent, nonprofit corporation with the vision that "no patient shall be harmed by anesthesia"[17].

In 2010, the European anesthesiology organizations commenced The Helsinki Declaration for Patient Safety in Anesthesiology for improving anaesthesia care in Europe[18].

The American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database defines operative mortality as any death within 30 days of an operation[19]. The Society of Thoracic Surgeons (STS) National Database includes both 30-day mortality and discharge mortality, which includes any in-hospital deaths following a procedure during that hospitalization. These measures provide surgeons a benchmark for performance, the 30-day interval has generally been presumed to be proximal enough to the procedure to capture mortality attributable to it[20].

Since thirty-day mortality and discharge mortality has been presumed to capture procedure-related mortality, critically ill postoperative patients may experience protracted hospital courses only to be readmitted with complications that lead to their death after the 30-day mark, whereas others may be transferred to outside facilities or may be successfully discharged and then die unexpectedly at home leading to the underreporting of surgery-related deaths[19].

However, others have suggested that a period of 90 days may be more appropriate [21]. The fact that Medicare reimbursement for major surgical procedures includes all care during the first 90 days after the operation highlights the belief that care, and hence risk, does not end at 30 days[19].

Additionally, the increased scrutiny of outcomes introduces a potential perverse incentive to prolong the life of a dying patient past the 30-day barrier or to transfer the patient to another facility before 30 days has passed[19].

McMillan et al[19] performed a retrospective review of prospectively maintained institutional databases of 7646 patients undergoing resection for lung cancer, esophageal cancer, and mesothelioma from 1999 to 2012. Among the different cancers and across operations, the additional mortality from day 31 to 90 (1.4%) was similar to that by day 30 (1.2%), resulting in overall 90-day mortality (2.7%) that was more than double 30-day mortality. Respiratory failure, sepsis, and cardiac events were the leading causes of death after thoracic resection.

The preventable perioperative complications are evaluated to improve the safety of health care, including also the medical-law point of view; the adaptation of monitoring techniques and the adoption of guidelines have already contributed significantly to

this goal reducing mortality, and the detailed investigation of actual or suspected iatrogenic deaths is a crucial piece for the continuous improvement of health care[22].

Evidence gathered from postmortem investigation of PO deaths and audit program (centered on incidence, causes and consequences, included into a critical incident datasets) systematically adopted by health care systems may indicate an interdisciplinary, useful strategy of clinical risk management and support the decision about medical negligence[7].

Monitoring in a post-anesthesia care unit is now mandatory for all general, neuraxial, and regional anesthetics. For high-risk patients, continued monitoring in an intensive care unit may reduce anesthetic mortality. Inability to provide or failure to use these facilities may increase anesthesia-related mortality rates[23].

Most of the hospitals have regular meetings to discuss surgical complications and perioperative mortality. Specific cases may be investigated more closely if a preventable cause has been identified[8]. Patient safety factors were suggested to play an important role, with use of the WHO Surgical Safety Checklist associated with reduced mortality at 30 days[24].

4. Summary

The high perioperative mortality rate in surgical patients due to poor physical status indicates that primary prevention may be important in reducing perioperative mortality. These findings explained the need to improve medical perioperative practices for high-risk patients in under-resourced settings.

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