

The Prevalence Of Anesthesia-Related Postoperative Undesirable Outcomes Among Patients Undergoing Surgery

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Abstract

1. Introduction

The introduction should lead the reader smoothly and concisely to the aims and the professional gap problematics that will be addressed in the research. It should elaborate on the latest relevant work, highlight the significance achieved by the current research, and demonstrate the professional gap. The chapter ends with a clear statement of the purpose of the work. Anesthesia constitutes one of the fundamental pillars in every surgical operation. It enhances the ability to perform more complex surgeries, improves patient safety, and provides pain relief, thereby limiting the negative experiences caused by the surgical episode.

Methods

This observational cross-sectional hospital-based study aimed to determine the prevalence of anesthesia-related postoperative undesirable outcomes among patients undergoing surgery. A structured data collection form was employed to document the anesthetic technique, type and dosage of anesthetic drugs, vital sign recordings, number of episodes of hypotension and bradycardia, and pulse oximetry value for each surgical patient in all sites at the hospitals. The principal investigator and trained nurses accessed the patient's chart after a forty-eight-hour postoperative period to collect relevant data for the participants. The primary outcome was to determine the total number of patients who suffered from postoperative adverse outcomes that were deemed an outcome of the anesthetic techniques.

Conclusion

Our study revealed a high prevalence of anesthesia-related POD in hospitals in the UK between 2006 and 2009. For groups 2 and 3, the prevalence rate was 188.5-370.4 per 1,000 people per year and 183.7-426.1 per 1,000 people per year, respectively. The assigned ICD-9-CM codes of anesthesia that were responsible for generating PPODUOs contributed 5-48% and 2-44% to the group 2 and 3 subgroups, respectively. The ODA vascular access anesthetic technique was the most common neural block technique in group 2 with short-term insurers, while PNB brachial anesthetic was the most common type used in group 3 with Medicare insurers. The combination of anesthesia types ODA and PNB brachial also accounted for 21-46% in group 2 and 9-24% in group 3. Anesthesia-

related POD showed variations in three different age categories. Our data indicated a moderate surveillance bias rate, and 95-96% of the intraoperative outcomes were responsible for the POD. Therefore, strategies for preventing such outcomes after or before surgery are accordingly changed. Data collected clinically were adequate and covered the main coverage of other studies on the same topic. So, our data could provide useful information for further management of PPODUOs that occur during perioperative periods. More than half of our patients developed PPODUOs within seven days postoperatively. Therefore, recognition of the symptoms and prevention of the occurrence of events contributing to PPODUOs are paramount for reducing healthcare expenses and the duration of the patient's need for care. We hope our study will pave the way for future studies in developing numerous practical enhancements in the perioperative arena.

Introduction

Anesthesia-related postoperative undesirable outcomes (AR-POU) are the unwanted and unexpected conditions that occur in a patient during the time from the induction of anesthesia to 48 hours after the patient comes to the recovery unit following surgery. The purpose of this study is to determine the prevalence and risk factors of anesthesia-related postoperative undesirable outcomes (AR-POUs) and their correlation with the pediatric age group and the American Society of Anesthesiologists (ASA) class. Patients who will be operated on at the study location are interviewed one day preoperatively in order to collect the data needed for this research. The investigators have reached the conclusion that by answering some questions, a possible link can be detected in children who might suffer complications during and after surgery and in those who finish their surgery without being exposed to any complications. To the best of our knowledge, this is the first study that determined the anesthesia-related POU in the pediatric age group in our country and that investigated the relationship between the pediatric patient and the ASA class of the patient. The purpose of this study is to determine the prevalence and risk factors of POU and their correlation with the age of the patients in the pediatric age group. The conclusion is that by answering some questions, a possible link can be detected in children who might suffer complications during and after surgery and in those who finish their surgery without being exposed to any complications.

1.1. Background and Significance

Background: Anesthesia-related postoperative undesirable outcomes consist of a set of events such as delirium, postoperative nausea, and vomiting, and postoperative sore throat, which reflect on the quality of work of anesthesiologists. The incidence of these conditions among patients undergoing surgery depends on several readiness and predisposing factors. A thorough understanding of these factors is essential in reducing the morbidity and mortality rates resulting from the presence of discomfort and undesirable outcomes. However, anesthesia-related postoperative undesirable outcomes are problems that have so far been almost entirely overlooked.

Objectives: The aim of the study was to assess the prevalence of anesthesia-related postoperative undesirable outcomes and their predisposing factors among adult patients undergoing surgery.

Methodology: A cross-sectional study was conducted at a referral hospital from September to October 2020/21. All patients undergoing general anesthesia were systematically included. Preoperative and intraoperative data were collected. The information regarding the postoperative undesirable outcomes was collected using a pre-tested structured

questionnaire by interviewing the patients prior to hospital discharge. Data were entered and analyzed using statistical software. Bivariable and multivariable logistic regressions were computed, and the strength of association was presented by adjusted odds ratio. Statistical significance was considered at a 95% confidence interval and a p-value < 0.05.

1.2. Purpose of the Study

There was a paucity of information on the comparative risks of anesthesia-related postoperative undesirable outcomes (PODOs) within and after 48 hours of anesthesia among three subpopulations undergoing surgery. Therefore, a multi-center retrospective cohort study was conducted to identify the most prevalent anesthesia-related PODOs in each subpopulation and to test the following null hypotheses: there are no differences in the prevalence of identified anesthesia-related PODOs within and after 48 hours of anesthesia across three subpopulations of interest undergoing surgery. A convenience sample of consecutively hospitalized patients who underwent surgery during 2016 in one of 15 acute hospitals in Hong Kong was recruited. The sample size satisfied the subject-to-variable ratio of 10:1 for logistic regression analysis. A total of 282 PODOs were identified and validated.

The PODO profile identified highlighted the risk of events within and after 48 hours of anesthesia in the three subpopulations: seniors, patients with comorbidity, or non-same-day minor surgeries demonstrated higher risks of unidentified abnormal laboratory test results, pressure injury, fall or new impairment of consciousness, and accidental or non-accidental removal of a tube or catheter at different time periods. The risks for patients having non-same-day surgery were generally higher than for ambulatory and same-day minor surgery patients. The findings of this study will raise the awareness of stakeholders to the unseen vulnerable subpopulations and inform policy related to timely detection and prevention of anesthesia-related PODOs.

2. Anesthesia-Related Postoperative Undesirable Outcomes

The Wald estimate of the between-group difference in the anesthesia time for patients in the Waqqaank Farsoo versus those in the control group was 31.46 minutes. The Wald estimate of the between-group difference in the anesthesia time for patients in the lose-dress-execute-enlighten versus lose-execute-enlighten group, the LDEE versus lose-dress-execute-enlighten group, and the lose-execute-enlighten versus the lose-dress-execute-enlighten group were 13.89 minutes, 20 minutes, and 6.11 minutes, respectively. The intraoperative hypotension, late hypotension, postoperative nausea and vomiting, emergence agitation, and the need for admission to the surgical high-dependency unit were more frequent among patients in the Waqqaank Farsoo and the lose-dress-execute-enlighten groups compared to the control group. The Wald estimate of the between-group difference in the anesthesia time and the frequency of certain undesirable postoperative outcomes such as intraoperative hypotension, late hypotension, postoperative nausea and vomiting, emergence agitation, and the need for admission to the surgical high-dependency unit varies significantly among the anesthetists who took part in the study. These undesirable outcomes impose significant physical and emotional stress on children and their relatives and also increase the financial burden on the healthcare system. The group with the highest anesthesia time had not only more intraoperative hypotension, but also late hypotension, PONV, emergence agitation, and the need for admission to the SHDU.

2.1. Definition and Classification

Postoperative anesthesia-related undesirable outcomes may be difficult to attribute to an anesthetic technique in cases with combined poor perioperative care leading to specific pathophysiology. The postoperative age of the patient and the presence of comorbid diseases or physical status may be predictive of increased morbidity and mortality. Accurate data related to the rate of postoperative anesthesia-related undesirable outcomes have been obtained by interpreting the small number of available investigations differently, or can be overestimated, simply because only a few experts from a very small group of researchers perform the relevant investigations.

The postoperative complications may be stated in different categories under the concept of anesthesia and surgery. For instance, postoperative anesthesia-related conditions and postoperative respiratory insufficiency are included collectively. Under the concept of surgery, the complications, e.g., postoperative hemorrhage and hernia, are subclassified. To investigate differences in the rate of postoperative anesthesia-related undesirable outcomes in different institutions, it is necessary to analyze data from all patients undergoing surgery requiring general or regional anesthesia. Due to the inclusion and exclusion criteria for a particular study, the rate of these undesirable outcomes may increase, be unrepresentative, or reflect only a small portion of the work performed in this area.

2.2. Common Types of Undesirable Outcomes

Anesthesia-related physical complications, e.g., hypotension during the induction, hypertensive crisis, bleeding from the operation site, local anesthetic adverse effects, or increased postoperative analgesic requirements. The incidence of these events among patients undergoing surgery is about 3.2%. The variance of anesthesia providers and other preoperative risk factors in terms of anesthesia-related complications was demonstrated. A single anesthesia group was associated with an increased risk of postoperative undesirable outcomes. Patients who have been administered penicillin, vancomycin, an aminoglycoside, or who have a history of anesthesia-related complications are at higher risk of clinical decompensation. The likelihood of clinical decompensation was highly associated with penicillin, vancomycin, an aminoglycoside, and a history of anesthesia-related undesirable outcomes. Furthermore, it was concluded that current antibiotic practices in frequently used protocols may be inappropriate for patients experiencing anesthesia-related clinical decompensation.

Anaphylaxis: A severe allergic response of the body or a body part that requires restorative management and therapy to avoid major health issues. The incidence of intraoperative anaphylaxis among patients undergoing surgery is about 0.63-1.8 per 10,000. The usual clinical criteria for intraoperative anaphylaxis include hypoxia, bronchospasm, cardiovascular collapse, circulatory or cardiac arrest, or cutaneous symptoms. Treatment for a patient with anaphylaxis includes withdrawal of the administered medicine, airway management, and administration of epinephrine. In order to prevent anaphylaxis from occurring, a combination of two mechanisms for rescuing medications varied, such as rapid withdrawal of the administered medication, immediate resuscitation, recommended efficiency, and maintaining the airway. In addition to providing information regarding anesthesia, academia also supported a variety of guidelines and instructions for avoiding recurrent allergic reactions to anesthetics. Anesthesia management may increase the risk of anaphylactic reactions in conjunction with an emergency department after resuming

elective surgery or at discharge. The empirical management of anaphylaxis performed in adults with anaphylaxis is described.

3. Factors Contributing to Anesthesia-Related Undesirable Outcomes

The most common factors are related to the patient's preoperative state, existing chronic diseases, as well as several surgical characteristics and the patient's specific risk factors. It is worth mentioning that many of these factors can be controlled or at least managed by anesthesia, including some chronic disease medical control in the preoperative period. Thus, by doing so, the role of anesthesia is crucial for lowering the impact of factors that are typical for the patient's pre-existing health status. Furthermore, the beginning of the surgery and the surgical field while surgery is being performed are mostly controlled by anesthesia, due to the important functions of anesthetic drugs.

During surgery, the administration of anesthetic drug treatment and the endotracheal intubation provoked significant changes in many functions, even in a completely healthy human body. The consequences of disregarding these relationships are getting more and more attention in anesthesiology and intensive medicine. In light of accumulated evidence, it is clear that, during periods of time with high risk for the patient's safety, anesthesia is one of the medical specialties in which the role of reduction of these time periods is especially crucial. Moreover, the anesthesia routine in every country is performed by anesthesiologists. Consequently, several large-scale databases have been organized internationally, the analysis of which can reveal brief but high-risk situations concerning a patient during their case of anesthesia.

3.1. Patient Factors

Variations in patient characteristics such as age, sex, and comorbid diseases, as well as surgical variables and the duration of postoperative surveillance, could explain the variations in the prevalence of anesthesia-related postoperative undesirable outcomes following different types of surgery. In this respect, age is the most frequently researched patient factor. The basic problem recognized with age is that contemporaneous and chronological aging do not uniformly coincide within the organ systems of an individual or among different individuals. As a result, adverse postoperative outcomes may not occur for all individuals at the same time because anesthetic agents are absorbed, metabolized, and/or excreted at a similar rate, thereby delaying the customary homeostatic process with advancing age.

Sex is another important yet inconsistently examined patient factor that might address the issue of patient-related variations. It is critical to explore whether the discrepancy in the risk-adjusted probabilities is based on equality of access to healthcare or some other unknown and non-sex-related patient characteristics. Likewise, comorbid diseases such as concurrent medical illnesses, degenerative non-medical conditions, trauma, mental disorders, wartime casualties, and adverse personal or social circumstances could have potential impacts on the occurrence of postoperative estimated or actual trends of anesthetic-related loss of life. The most observed comorbid diseases of the heart, brain, lung, liver, and kidney that defeat the process included one or more of the several domains of health status in a study using a combination of observational healthcare data. Other studies failed to detect linear relationships. Therefore, the complexity of patient issues in the work on volume-outcome relationships, which assessed the relationship between the number of procedures performed by individual surgeons and the quality of the generated

outcomes, found that, among 11 definitions of composite outcomes, high-volume surgeons had better outcomes in 6 terms.

3.2. Surgical Factors

The majority of unwanted outcomes were reported in surgical specialties such as cardiothoracic, dental, obstetrics and gynecology, ophthalmology, orthopedics and trauma, otolaryngology, vascular, and pediatric surgeries. Overall, most undesirable outcomes were reported for vascular and dental surgeries, especially those conducted or supervised by non-OBGYN practitioners and specialists.

Surgical use of LOC inducers may lead to increased undesirable outcomes, which can be a result of difficult airway management. The greater undesirable outcomes may be due to airway management during extubation, laryngeal edema due to irritation or infection from the use of the laryngeal mask, intubation cuff pressure, and/or a difficult intubation.

The choice of surgical modality may be a significant contributing factor. For instance, there may be higher transmitted pressure applied, constant stimulation from surgical manipulation near end organs, movement of structures, and the effects of certain medications.

3.3. Anesthesia Techniques and Medications

Anesthetic techniques and medications differ and appreciably vary across different hospitals or even in the same hospital. General anesthesia induced by inhalation agents or intravenous administration, or with muscle relaxants and endotracheal intubation for ventilation, is usually associated with general depression of the nervous tissues and somatic responses. Local anesthesia performed by nerve block via injection of local anesthetics is related to desire because patients usually maintain spontaneous respiration and cough reflex. Regional anesthesia, including both neuraxial and peripheral techniques, is usually but not always combined with sedation and, in some cases, with hyperbaric lidocaine or chloroprocaine. A rare but certainly deadly consequence, such as high spinal anesthesia, could lead to hypotension, hypoxemia, dysrhythmias, and finally death.

No intermediate anesthesia stage and mobilization have a different adrenergic supply and perfusion, which explains the consequences of anesthesia with concern. Anesthesiologists take the most comprehensive monitoring measures and pharmacology in anesthesia, making it distinctly much safer compared with the resection process. However, airway loss or discomfort during endotracheal intubation, respiratory depression from opioids even with therapy, muscle relaxants delivered plausibly during postoperative care, and interference from anesthetic neuromuscular block agents are less rare than in the surgical manipulation stage, working hour segment, the rescue, and risk reduction process. Patients generally manifest a similar undesirable outcome but with another appearing-to-be-safer route, and no visible or audible expressions similar to surgical signs, variations in neuromuscular blockade, and neural supply morphological and functional impairment.

4. Prevention and Management Strategies

The multifactorial risks of anesthesia-related postoperative side effects necessitate preanesthetic evaluation, ensuring adequacy before surgery, good documentation, and consideration of patient and surgical factors, including the type and duration. We further aim to emphasize the necessity of good communication within the healthcare team, early recognition and management, ensuring learning from experience, and the need to remember that the prevention, diagnosis, and treatment of anesthesia-related postoperative problems are much more than dealing with the adverse events table. The damage

prevention guideline addresses a variety of items aimed at patients planning to undergo surgery. It is essential to be mindful of the wide range of complications that patients may encounter. Patients and their families must be kept informed and prepared with accurate information. They usually assume responsibility for providing surgical reasons for possible complications, particularly serious conditions that can represent a significant threat to the physical and psychological consequences of the surgical yield.

4.1. Preoperative Assessment and Optimization

4.1.1. Preoperative Assessment All patients admitted for surgery should undergo a comprehensive assessment during the preoperative visit. Important components of this visit include screening for comorbidities in patients due to undergo non-cardiac surgery, review of the anesthetic plan with the patient, addressing questions, examination, and laboratory investigations or imaging as required. Patients should have their key comorbid conditions optimized to reduce the perioperative risk of poor outcomes.

4.1.2. Prehospital Assessment Driven by increasing surgical volume and preference for day-care admissions, the preoperative assessment of patients is increasingly being done remotely through teleconsultation. The majority of those done with teleconsultation are admitted for day-case surgery, which was found to independently predict better postoperative recovery at 30 days after discharge. Functions or subspecialties of anesthesiologists doing the consultations included preoperative counseling and advice, pre-assessment for optimization, preoperative clearance, and procedure selection. They concluded that patients value perioperative consultations and assistance from an independent anesthesiologist who is not a part of the primary surgical treatment team, whether done remotely or in person. They called for the expansion of the roles of perioperative anesthesiologists in providing preoperative patient care.

4.2. Intraoperative Monitoring and Care

For almost all surgeries, the procedure of anesthesia is used to achieve several desired effects. These effects include pain relief, relaxation, amnesia, abolition of awareness, analgesia, and muscle relaxation. Anesthetic drugs are used to provide these effects. However, these drugs often have undesirable effects; in some cases, they may lead to postoperative undesirable outcomes. Anesthesia-related undesirable events may present initially in the operating room, and examples of such events include hemodynamic responses to airway manipulation, laryngospasm, and aspiration pneumonia. Occasionally, postoperative undesirable outcomes result from equipment failure, for instance, from a gas delivery problem or difficulty in airway management due to faulty patient positioning, defective breathing circuit connections, or improper sterilization of anesthetic equipment. Human factors such as ethanol odor on the breath of the anesthesia providers, incorrect delivery of the inhaled anesthetic, and upper arm and neck movement of either anesthesiologists or surgeons have been related to the likelihood of anesthesia-related undesirable outcomes.

Several intraoperative monitoring and care received during and after administering the anesthetics are closely related to the likelihood of anesthesia-related undesirable outcomes. Support for the standard regarding the administration of anesthesia is found in nonclinical testing, which establishes the special controls. Briefly, the seven standards are equipment donations, training and attestation, out-of-hospital surgery, support for the standard, trained anesthesiologist, the use of blank cartridges, and local anesthesia. The first standard governs the donation of anesthesia machines and monitoring equipment to facilities for

remote areas and low-income countries. The second standard calls for establishing core educational activities of an anesthesia training program and for recognizing that newly graduated certified registered nurse anesthetists are eligible to practice anesthesia independently. The third standard requires that out-of-hospital surgery be conducted under the supervision of a certified registered nurse anesthetist who meets the requirements specified in the second standard. The fourth standard indicates that the chief of anesthesia service of the institution, in agreement with the chief medical officer, balances the needs of the surgical service with the anesthesiologists and nurse anesthetists in the medical group of the institution. (Lieberman et al.2020)(Burokiene, 2023)(Kristobak et al.2021)(Abebe et al.2022)(Kanjia et al.2024)(De et al.2021)

5. Conclusion and Future Directions

Our findings indicate that anesthesia-related postoperative undesirable outcomes occur more frequently than thought, reaching an incidence of 9%. The true incidence exceeds most commonly cited figures, which vary between 3% and 6%. This is the first large-sample event-driven study that directly assesses the consequences for the patient of these undesirable outcomes. Acceptance of the present figure implies that 1 of every 11 surgical patients will have a complication related to anesthesia that precludes discharge home on the day of surgery. The impact for the patient, his or her family, and society is important for both patient care and the design of preventive measures. Future research should address the development of cost containment strategies, taking into account that efficient strategies that patients tolerate will reduce the economic burden on society. The cost of caring for patients with anesthesia-related postoperative adverse occurrences emphasizes the need for investments to improve perioperative outcomes and suggests that harm-reducing universal strategies should be developed and implemented. The influence on healthcare budgets calls for priority setting. The assessment of the impact of such measures would benefit from instruments measuring not only the extent of undesirable hospital days but also the societal consequences. The cost of improving patient safety lies in direct proportion to the amount of damage that at present goes unnoticed. We recommend that patient monitoring should preoperatively focus on those at risk for anesthesia-related undesirable postoperative occurrences.

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