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A study of Adverse events during anaesthesia at a tertiary teaching hospital in Maharashtra.

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ABSTRACT

BACKGROUND

Incident reporting systems are widely used in healthcare to analyze adverse events and have been shown to reduce patient harm. With data showing high anesthetic-related mortality in low- and middle-income countries (LMIC), such a system would allow more accurate identification of the size and type of events and could improve patient safety.

MATERIALS AND METHODS

This prospective observational study was done in the department of Anaesthesia in a tertiary teaching hospital in Maharashtra involved direct observations in the operating room and recording of any anesthesia-related adverse events occurring during the perioperative period.

RESULTS

100 surgical cases were observed during weekday hours. 32 side effects related to anesthesia were observed in 24 patients, 12 elective cases and 12 emergency cases, which resulted in the occurrence of side effects in 32% (n=32) and 24%

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(n=24) patients. Most cases occurred in infants under 1 year and 11 to 20 years (31.3%, n = 10) and patients receiving general anesthesia (66.7%, n = 16), especially in the induction phase (50%).) ; n=16), the most common long-term desaturation event (31.3%; n=10). Most events were considered to contribute to low-level injury (56.3%; n = 18). There was no intraoperative death.

CONCLUSION

This study presents evidence of a higher rate of adverse events during anesthesia in a tertiary teaching hospital in Maharashtra than reported in the current literature. This setting has the potential to generate and learn from large amounts of data with reporting systems. The most common event was desaturation detected by pulse oximetry, particularly in paediatric surgery.

Key words: Anaesthesia, Adverse events

INTRODUCTION

It is estimated that Deaths associated with human immunodeficiency virus (HIV) are higher than those associated with tuberculosis and malaria [1]. A 2015 report by the Lancet Global Commission on Surgery highlighted the need for universal access to safe, affordable surgical care and anesthesia [2]. operative mortality has been used as an indicator of surgical safety and anesthesia [3]. A World Federation of Anesthesiologists workforce survey found a 90-fold difference in the average workforce density of physician anesthesia providers in high-income countries (HICs) compared to low-income countries [4].

Critical events in anesthesia are defined as abnormal or preventable complications related to the administration of general or regional anesthesia that may or may not lead to a patient adverse outcome. Thus, patient safety can be improved by learning from reported critical incidents. Introduced in World War II to improve safety among

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aviators, critical incident reporting was implemented in 1978 as a method to investigate potential incidents in anesthesia [5]. Accident reporting systems are widely used by anesthesia departments in HICs to record, discuss and investigate adverse events [6], but similar data from LMICs are lacking [7]. A review of adverse events, critical events, and near misses in anesthesia has shown that they reduce recurrence and therefore reduce patient harm [8].

The aim of this study was to investigate the types and types of adverse events occurring during anesthesia in a major tertiary hospital in Maharashtra. This study reports perioperative adverse anesthetic events in patients undergoing surgery at one of the state'simportant teaching hospitals.

MATERIALS AND METHODS

The study was conducted in a tertiary government hospital in the department of Anaesthesia. This study involved observing surgical cases at the facility for six weeks to determine the incidence and type of adverse events occurring during anesthesia. Direct observations were included to overcome problems associated with standard reporting methods, such as inconsistencies in reporting, and to attempt to gain a more accurate picture of anesthetic adverse events occurring in this setting.

An adverse event was defined according to a systemic approach. Airway-related events included difficult and failed intubation, laryngospasm, regurgitation with aspiration, and the "can't intubate, can't ventilate" scenario. Respiratory events included bronchospasm and desaturation/hypoxia, defined as pulse oxygen saturation less than 90% for more than 3 minutes. Cardiovascular events included significant hypotension, defined as a drop in blood pressure of more than 30% below baseline or systolic blood pressure below 70 mmHg for more than 10 minutes, and

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intraoperative cardiac arrest. Events related to complications of regional anesthesia—failed spinal anesthesia, high spinal block, defined as block above the T4 level with cardiorespiratory compromise, and total spinal block (high spinal criteria plus loss of consciousness)—were included. Other events included drug and equipment – anaphylaxis, drug reaction or drug error (wrong drug, dose or route), equipment failure, loss of oxygen supply, anesthetic machine or ventilator failure, and critical power loss.

If an adverse event occurred, details of the event and event were recorded, including the phase of anesthesia in which the event occurred (induction, maintenance, or onset). The severity (degree of harm) of each adverse event was defined by assessing the interventions required and the patient's postoperative status. A five-point system was used to assess the level of impairment, with no injury categorized as 'none or almost past', short-term impairment requiring special monitoring or minor intervention categorized as 'low', short-term impairment requiring intervention or medical treatment categorized as 'moderate' and permanent or long-term damage categorized as "severe". The fifth and last class was death.

Study population: This prospective observational study included direct perioperative observation of patients undergoing anesthesia for surgery during daytime hours on observed at major (general, urological, pediatric, ENT) and orthopedic operating rooms, therefore obstetrics, gynecology and ophthalmology were excluded. Elective and emergency surgical cases, as well as general and regional anesthesia techniques, were covered. Patients of all ages were included.

Data collection: A paper checklist was created before observation to record case demographics including age, sex, American Society of Anesthesiologists (ASA)

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grade, emergency or elective case, anesthetic technique, presence of various monitoring modalities during anesthesia and surgery. and any of the listed anesthesia-related adverse events that occurred during surgery.

Data analysis: Data were converted into electronic format and analyzed using Microsoft Excel and are presented as descriptive statistics, including absolute numbers and percentages.

RESULTS

Case demographics: a total of 100 cases were observed over the six week study period, 56% (n=56) were elective surgical cases, with the remainder emergencies. Anaesthesia mode included 60% (n=60) general anaesthesia, 56% (n=56) with airway intervention and 4% (n=4) without and the remaining 40% (n=40) under spinal anaesthesia. Patients were majority female (68%; n=68), ASA class I (66%; n=66) or II (28%; n=28) and 21-60 years of age (48%; n=48). Infants under one year constituted 8% (n=8) of cases, children aged 1-10 years 14% (n=14), 11-20 years 18% (n=18) and the remaining 12% (n=12) over 60 years. Surgical specialty mix included general (38%; n=38), orthopaedic (40%; n=40), urology (14%; n=14), and ENT/maxillofacial (8%; n=8).

Intraoperative monitoring: all patients had continuous heart rate and oxygen saturations monitored by pulse oximetry and all but four infants (92%; n=46) had non-invasive blood pressure measurement at least every five minutes. Precordial stethoscopes were in use in the four infants. End tidal carbon dioxide monitoring was only available in one of the seven theatres and therefore only observed in 6% (n=3) cases (all cases carried out in that theatre). Temperature monitoring did not occur in any cases.

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Adverse events: according to the criteria set out, there were 32 adverse events observed in 24 patients, an incidence of 32%, with an even mix of elective (n=12) and emergency (n=12) cases. The distribution of adverse events was 66.7% (n=16) male and 33.3% (n=8) female. Most incidents occurred in infants less than one year (31.3%; n=10; 6 patients) and those aged eleven to twenty years (31.3%; n=10; 6 patients), with the remaining 12 incidents spread across the remaining age ranges. Two thirds (66.6%; n=16) of patients were ASA class II. Three separate events were observed in two patients, one of whom was ASA class IV.

Two thirds of patients were undergoing general anaesthesia (66.7%; n=16). Most events occurred during induction (50%; n=16) followed by maintenance (31.3%; n=10) and emergence from anaesthesia (18.8%; n=6). The commonest category of event was respiratory, specifically desaturation/hypoxia, 31.3% (n=6) of all incidents observed. 6 of the 10 desaturation events occurred in infants less than one year. The second most common event was failed spinal. There were no drug related events. There were multiple power outages although these did not result in any adverse events as anaesthesia machines all had battery life to rely upon temporarily.

Of the 32 incidents, three quarters resulted in either no harm or a low level of harm. The events observed did not lead to any severe or permanent harm or intra-operative deaths. Adverse events are summarised in Table 1 and details of cases with observed adverse events are illustrated in Table 2.

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DISCUSSION

Reporting of significant events and adverse events is essential for anesthesia specificity; discussion of these events can inform policies or training programs to prevent relapse and ultimately improve patient care [6,7]. The incidence of adverse events observed in this study (32%) is significantly higher than that reported elsewhere[9] [10]. Most of the most significant events in this study occurred during induction, which is often seen as "phase-rich events" [11]. Induction events account for a significant proportion of events in other studies, but are often eclipsed by maintenance phase events [12,13].

In this study, the majority of adverse events occurred in infants less than one year old. Our study is consistent with reports [11,14–16] that the most common event is respiratory distress, with desaturation being the most common event in infants. Anatomical and physiological differences between adults and children present a challenge for anesthesia providers with children showing a tendency to desaturate more quickly. The high demand for pediatric surgery has contributed to anesthetic-related mortality and adverse events, highlighting the need to focus on the safety of pediatric anesthesia services.

Failed or inadequate spinal anesthesia accounted for a significant proportion of the adverse events observed in this study. The damage rate for this case is low. It can be a contributing factor to the patient's position during spinal anesthesia; In this study, the patient was seated cross-legged on the operating table, which was more successful than sitting on the side chair with the first leg effort [17]. The rate of adverse and critical events in the current literature is based mainly on retrospective analysis of records and voluntary submission of event types, which may lead to

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incomplete data sets. A study on compliance in filling out this form showed that only 30% of cases were reported [18]. The variation in rates can be explained by differences in the perception of what is defined as an adverse event or a critical event, and by fear of consequences, misunderstanding of the consequences of learning, and changes in the "no-blame" culture. Current research reports directly observed events.

A possible reason for the high incidence in this study is the low threshold for reporting, including severe and "serious" events. 24 of the 32 events in this study were considered serious or non-harmful, and similar events can be considered unreportable in other settings or populations. For example, events of hypotension or hypoxia cannot be reported unless they are harmful or related to an important cause. embolic events. Other factors should also be considered, for example, two patients with multiple cases may be reported as a single case combination in multiple systems. This study did not take into account other variables. First attempt at intubation or spinal anesthesia by a student. Anesthetic exposure is necessary for students to learn, but can cause adverse events.

This study has several limitations; This study was observed only during the day, and the proportion of events may have occurred in hours, or the study did not analyze the events in depth considering the contribution of pre-existing conditions, severity of surgery, or factors related to surgery. Because of its prospective nature, it is important to consider the small amount in this work.

CONCLUSION

Critical incident and adverse event reporting systems can enable monitoring, analysis and discussion that can lead to training or policy interventions. This study, conducted in Maharashtra revealed higher adverse events than those reported in the

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current literature on adverse events during anesthesia. The most common anesthetic-related event was desaturation detected by pulse oximetry, particularly in pediatric surgery. To improve anesthesia and surgical safety, surgical morbidity and mortality surveillance is essential to identify preventable causes and potential interventions.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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TABLES AND FIGURES:

TABLE 1 : Adverse events during anaesthesia

Category and adverse event	Percent of cases (n)
Airway	25% (8)
Difficult intubation (>3 attempts)	12.5% (4)
Failed intubation, Can't intubate, can't ventilate scenario, Bronchospasm, Intraoperative cardiac arrest, Drug related, Anaphylaxis, Other adverse drug reaction, Drug error (wrong drug/dose/route), Loss of oxygen supply, Failure of anaesthetic machine or ventilator, Critical loss of power	0
Laryngospasm	6.3% (2)
Regurgitation with aspiration	6.3% (2)
Respiratory	31.3% (10)
Desaturation/hypoxia (all categories)	31.3% (10)
Desaturation/hypoxia (SpO2 <90% for >3mins)	18.8% (6)
Desaturation/hypoxia (SpO2 <85% for >3mins)	12.5% (4)
Circulatory	12.5% (4)
Hypotension (>30% below baseline for >10 mins or SBP <70mmHg for >10 mins)	12.5% (4)
Spinal anaesthesia related	25% (8)
Failed (>2 attempts with no block or inadequate block requiring supplementation)	18.8% (6)
High (associated with cardiorespiratory compromise + block >T4 (if checked))	6.3% (2)
Equipment	6.3% (2)
Equipment fault	6.3 (2)
Level of harm	
None or near miss: no harm occurred	18.8% (6)
Low: short term harm requiring extra monitoring or minor intervention	56.3% (18)
Medium: short term harm requiring intervention or medical treatment	25% (8)
Severe: permanent or long-term harm, Death	0

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Table 2:Summary of adverse events

Age range	Sex	ASA	Urgency	Specialty	Anaesthesia	Event
<1	M	2	Emergency	General	General	Aspiration hypoxia
>60	M	2	Emergency	Urology	General	Hypotension
21-60	M	1	Emergency	Urology	Spinal	Failed spinal
11-20	F	4	Emergency	General	General	Hypoxia equipment fault
<1	M	2	Elective	General	General	Hypoxia
<1	M	2	Emergency	General	General	Difficult intubation
21-60	M	1	Emergency	General	General	Hypotension
>60	M	2	Elective	General	Spinal	High spinal
21-60	F	2	Elective	General	General	Difficult intubation
1-10	M	2	Elective	Ortho	General	Laryngospasm
11-20	M	2	Elective	Ortho	Spinal	Failed spinal
11-20	F	1	Elective	Ortho	Spinal	Failed spinal
<1	M	2	Emergency	General	General	Aspiration hypoxia
>60	M	2	Emergency	Urology	General	Hypotension
21-60	M	1	Emergency	Urology	Spinal	Failed spinal

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11-20	F	4	Emergency	General	General	Hypoxia equipment fault
<1	M	2	Elective	General	General	Hypoxia
<1	M	2	Emergency	General	General	Difficult intubation
21-60	M	1	Emergency	General	General	Hypotension
>60	M	2	Elective	General	Spinal	High spinal
21-60	F	2	Elective	General	General	Difficult intubation
1-10	M	2	Elective	Ortho	General	Laryngospasm
11-20	M	2	Elective	Ortho	Spinal	Failed spinal
11-20	F	1	Elective	Ortho	Spinal	Failed spinal