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ORIGINAL ARTICLE

ANALYSIS OF CRITICAL INCIDENTS IN PEDIATRIC ANAESTHESIA - A CLINICAL STUDY

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ABSTRACT:
Background: Critical incident monitoring is important in quality improvement and patient safety as it identifies potential risks to patients by analyzing adverse events or near-misses. The present study was conducted to report the incidence of critical events occurring in the department of anesthesia during surgery in children.
Materials & Methods: This study was conducted in the department of anesthesia in Jan 2015 to Dec 2015. It included 1050 children upto 15 years of age who underwent any procedure in pediatric surgery OT. Children undergoing Cardiac and ear, nose, throat (ENT) surgeries, thoracic, abdominal, genitourinary procedures, neurosurgeries and paediatric surgeries such as circumcision, examination and dressing under general anaesthesia, lymph node biopsy. Children having pre-operative cardiovascular compromise (hypotension, hypertension, arrhythmias) were excluded from cardiovascular adverse events. Those having pre-operative desaturation/hypercarbia (congenital diaphragmatic hernia [CDH], tracheoesophageal fistula) were excluded from respiratory adverse events. <94% Oxygen saturation was considered as desaturation and >50 mm Hg end-tidal carbon dioxide (ETCO2) was considered as hypercarbia. For laparoscopies, ETCO2 values <60 mm Hg was not considered as a critical incident. Pre-anaesthetic check (PAC), intraoperative and postoperative check was done in the post-anaesthesia care unit (PACU). Electrocardiogram (ECG), and pulse rate, pulse oximetry, ETCO2, blood pressure and temperature was monitored. **Results:** Out of 1050 patients, 250 were neonates, 300 were infants, 340 were toddlers and 160 were other children. We found that 25 neonates, 33 infants, 44 toddlers and 24 other children had critical events. The incidence rate was 12%. Respiratory incidents reported were laryngospasm (20), SGD related incidents (12), inappropriate size ETT (3), difficult neonatal intubation (5), difficult mask ventilation (6), accidental extubation (8), upper airway obstruction (8), urgent reintubation (5), bronchospasm (7) and hypercarbia (6). Associated desaturation was seen in laryngospasm (11), SGD related incidents (3), inappropriate size ETT (2), difficult neonatal intubation (6), difficult mask ventilation (3), upper airway obstruction (6), urgent reintubation (2), bronchospasm (2) and hypercarbia (1). Cardiovascular incidents were bradycardia seen in 7 patients, inferior vena cava rupture in 3 patients and accidental carotid punctures in 2 patients. The degree of harm recorded was no harm in 8 patients, low harm (31), moderate harm (68), severe harm (18) and I case of reported death. Critical incidents occurred in less than 2 hours (68), 2-6 hours (44) and more than 6 hours (14). **Conclusion:** Critical incident reporting is useful in perioperative safety of children. The anaesthesiologists can play important role in recording critical incidents. There is need to established critical incident monitoring system.
Key words: Bronchospasm, Critical incident, Hypercarbia

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INTRODUCTION

Critical incident monitoring is important in quality improvement and patient safety as it identifies potential risks to patients by analyzing adverse events or near-misses. Flanagan[1] in 1954 first described critical incident technique to improve safety among military pilots, and was subsequently refined for nonmedical and medical uses. Later, this technique was adapted by Cooper et al.[2] in 1978 to uncover patterns of frequently occurring incidents in an anesthesia department. The original definition of a critical incident by Cooper and colleagues was an occurrence that could have led or did

lead to an undesirable outcome. This was subsequently developed into a national plan in the Australian Incident Monitoring Study in 1988. Currently, there are many established incident monitoring programs worldwide in anesthesia including the American Society of Anesthesiologists (ASA) Committee on Patient Safety and Risk Management, and National Patient Safety Agency in the United Kingdom. Patient safety is the cornerstone of good patient care.[3] This is especially important in the operating room setup. The perioperative care of children is even more challenging resulting in set up of specialised paediatric care centres with professionals trained to cater to this patient population. Reporting of critical incidents and near misses is an established method of improving patient safety. It provides insights into the system and plays a key role in learning from problems.[4] It allows lessons to be learnt, helps in implementing change and prevents similar incidents from occurring in future. Most countries adopt a National Reporting system for identifying critical incidents, for example, Australian Incident Monitoring System (AIMS), United Kingdom (UK) National Reporting and Learning Systems (NRLS). However, in India, we do not have established reporting systems. Most of the previous studies of critical incident reporting are based on analysis of records.[5]

The present study was conducted to report the incidence of critical events occurring in the department of anesthesia during surgery in children.

MATERIALS & METHODS

This study was conducted in the department of anesthesia in Jan 2015 to Dec 2015. It included 1050 children upto 15 years of age who underwent any procedure in pediatric surgery OT. All patients were informed regarding the study and written consent was taken. Subject information regarding name, age, sex etc. was taken.

Following inclusion and exclusion criteria was used.

Inclusion:- Children undergoing Cardiac and ear, nose, throat (ENT) surgeries, thoracic, abdominal, genitourinary procedures, neurosurgeries and paediatric surgeries such as circumcision, examination and dressing under general anaesthesia, lymph node biopsy.

Exclusion: Children having pre-operative cardiovascular compromise (hypotension, hypertension, arrhythmias) were excluded from cardiovascular adverse events. Those having pre-operative desaturation/hypercarbia (congenital diaphragmatic hernia [CDH], tracheoesophageal fistula) were excluded from respiratory adverse events. <94% Oxygen saturation was considered as desaturation and >50 mm Hg end-tidal carbon dioxide (ETCO2) was considered as hypercarbia. For laparoscopies, ETCO2 values <60 mm Hg was not considered as a critical incident.

Pre-anaesthetic check (PAC), intraoperative and postoperative check was done in the post-anaesthesia care unit (PACU). Electrocardiogram (ECG), and pulse rate, pulse oximetry, ETCO2, blood pressure and temperature was monitored. Results were tabulated and subjected for correct inferences. P value < 0.05 was considered significant.

RESULTS

Table I shows that out of 1050 patients, 250 were neonates, 300 were infants, 340 were toddlers and 160 were other children. Graph II shows that 25 neonates, 33 infants, 44 toddlers and 24 other children had critical events. The incidence rate was 12%. Graph I shows that respiratory incidents reported were laryngospasm (20), SGD related incidents (12), inappropriate size ETT (3), difficult neonatal intubation (5), difficult mask ventilation (6), accidental extubation (8), upper airway obstruction (8), urgent reintubation (5), bronchospasm (7) and hypercarbia (6). Associated desaturation was seen in laryngospasm (11), SGD related incidents (3), inappropriate size ETT (2), difficult neonatal intubation (6), difficult mask ventilation (3), upper airway obstruction (6), urgent reintubation (2), bronchospasm (2) and hypercarbia (1). Graph II shows that cardiovascular incidents were bradycardia seen in 7 patients, inferior vena cava rupture in 3 patients and accidental carotid punctures in 2 patients. Graph III shows that degree of harm recorded was no harm in 8 patients, low harm (31), moderate harm (68), severe harm (18) and I case of reported death. Graph IV shows that critical incidents occurred in less than 2 hours (68), 2-6 hours (44) and more than 6 hours (14).

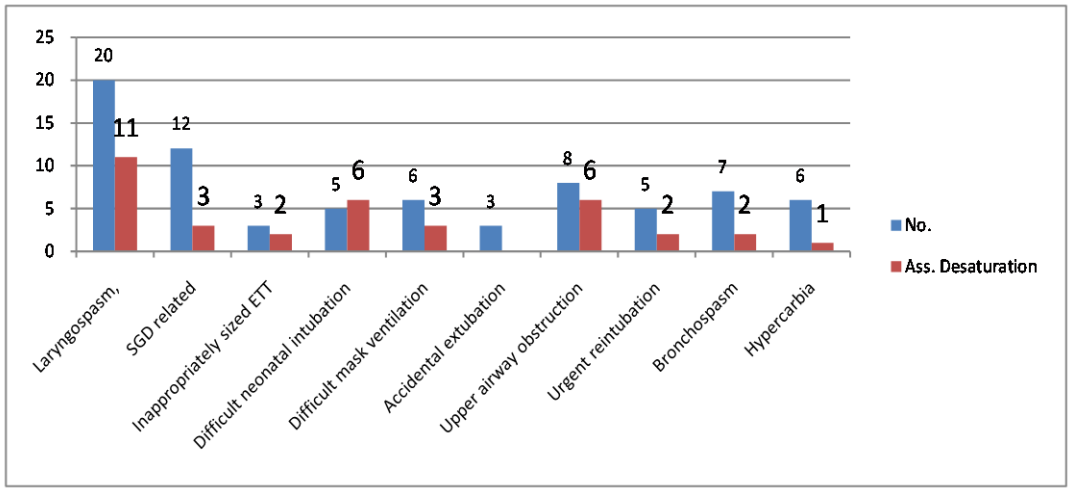
Table I Distribution of patients

Total - 1050			
Neonates	**Infants**	**Toddlers**	**Other children**
250	300	340	160

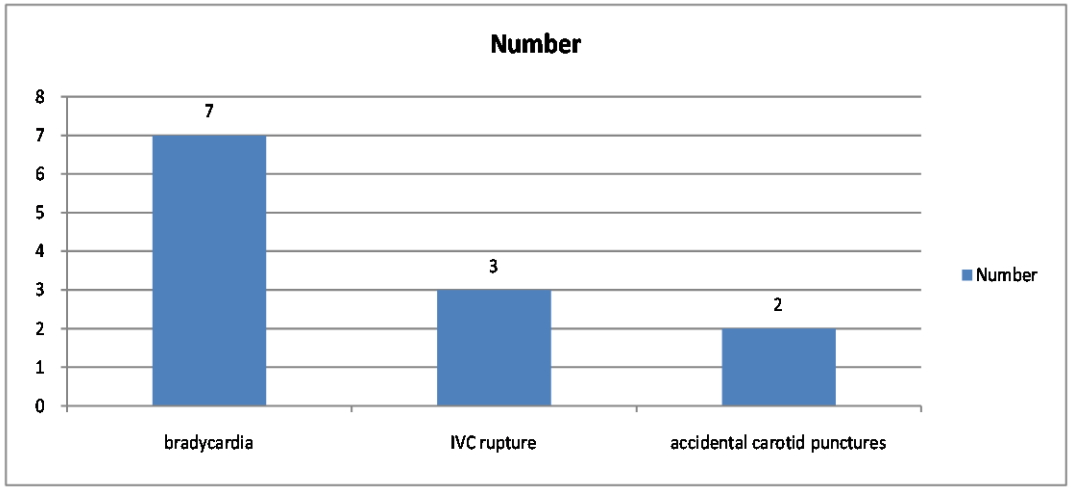
Table II Incidence of critical events in patients

	Total	Incidence
Neonates	250	25 (10%)
Infants	300	33 (11%)
Toddlers	340	44 (13%)
Other children	160	24 (19%)
Total	1050	126 (12%)

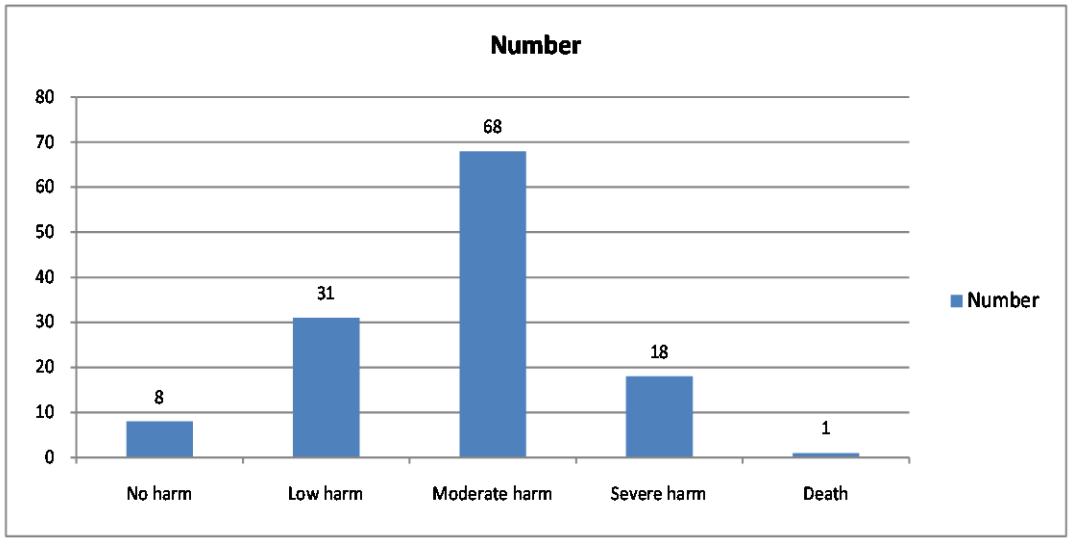
Graph I Distribution of respiratory and airway critical incidents



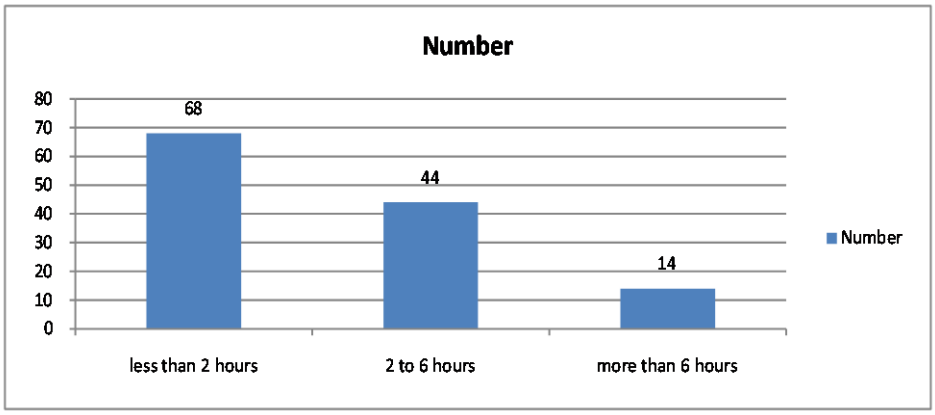
Graph II Cardiovascular incidents



Graph III Degree of patient harm



Graph IV Critical incidents and duration of surgery



DISCUSSION

Critical incidents may be useful in assessing the complications that can occur following anaesthesia. Critical incident analysis was first introduced by Flanagan in 1954 and was used in aviation. The present study was conducted to report the incidence of critical events occurring in the department of anesthesia during surgery. In year 2015, 1050 children patients underwent surgery due to several reasons. 250 were neonates, 300 were infants, 340 were toddlers and 160 were other children. Similar study was done by Tay CL et al[6] in which they did study on 249 children and recorded the incidence.

In this study, we found that 25 neonates, 33 infants, 44 toddlers and 24 other children had critical events. The incidence rate was 12%. This is in accordance to Murat I et al.[7] In their study the incidence rate was 14.2%.

We found that maximum cases of incidents were of respiratory incidents such as laryngospasm followed by Supraglottic airway device (SGD) related incidents, accidental extubation, upper airway obstruction, bronchospasm, and hypercarbia, difficult neonatal intubation, difficult mask ventilation, urgent reintubation and inappropriate size ETT. Associated desaturation was seen in patients. Similar incidents were seen in study of Cohen MM et al.[8] In our study, cardiovascular incidents were bradycardia seen in 7 patients, inferior vena cava rupture in 3 patients and accidental carotid punctures in 2 patients. This is in accordance to Gupta S et al.[9] Degree of harm recorded was no harm in 8 patients, low harm (31), moderate harm (68), severe harm (18) and I case of reported death. Marcus R[10] also recorded maximum cases of moderate harm in her study. We found that Graph IV shows that critical incidents occurred in less than 2 hours (68), 2-6 hours (44) and more than 6 hours (14) surgeries. Khan FA[11] suggested that shorter the procedure more likely to happen the incidents. Critical incident reporting is a valuable part of quality assurance.

Identifying and mitigating risk factors associated with patient harm can improve patient safety. Higher ASA status appears to be the most important contributory factor that results in actual or potential patient harm in our study. Also significant, was time of incident, with incidents more likely out of hours.

CONCLUSION

Critical incident reporting is useful in perioperative safety of children. The anaesthesiologists can play important role in recording critical incidents. There is need to established critical incident monitoring system.

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