

**Original article:**

## **Evaluation of Critical Incidents in Pediatric Anaesthesia: An Hospital Based Observational Study**

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### **ABSTRACT**

**Background:** The perioperative care of children is even more challenging resulting in set up of specialized pediatric care centres. The present study was conducted to assess critical events in pediatric anesthesia.

**Materials & Methods:** This study was conducted in the department of Anesthesia. It comprised of 86 children. Pre-anesthetic check (PAC), intraoperative and postoperative checks was done in the post-anesthesia care unit (PACU). Electrocardiogram (ECG), and pulse rate, pulse oximetry, blood pressure and temperature were monitored. The incidence of the critical events was also recorded.

**Results:** Out of 86 patients, males were 46 and females were 40. Common critical events were laryngospasm in 5, difficult neonatal intubation in 6, difficult mask ventilation in 10, accidental extubation in 2, bronchospasm in 7, hypercarbia in 2, bradycardia in 1 and IVC rupture in 4. The difference was significant ( $P < 0.05$ ).

**Conclusion:** Most critical events such as laryngospasm, difficult neonatal intubation, difficult mask ventilation, accidental extubation, bronchospasm, hypercarbia, bradycardia and IVC rupture.

**Key words:** Anesthesia, Laryngospasm, Ventilation.

### **INTRODUCTION**

Patient safety is the cornerstone of good patient care. This is especially important in the operating room setup. The perioperative care of children is even more challenging resulting in set up of specialized 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. It allows lessons to be learnt, helps in implementing change and prevents similar incidents from occurring in future.<sup>1,2</sup>

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<sup>1</sup> in 1954 first described critical incident technique to improve safety among military pilots, and was subsequently refined for nonmedical and medical uses.<sup>2-4</sup>

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.<sup>3,4</sup> This is especially important

in the operating room setup. The perioperative care of children is even more challenging resulting in set up of specialized pediatric 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. It allows lessons to be learnt, helps in implementing change and prevents similar incidents from occurring in future.<sup>5-7</sup> The present study was conducted to assess critical events in pediatric anesthesia.

### MATERIALS & METHODS

This study was conducted in the Department of Pediatrics, Gujrat Adani Institute of Medical Sciences, Bhuj (Kutch), Gujarat, India. It comprised of 86 children age <18 years of both genders. Patients were informed regarding the study and written consent was obtained. Ethical clearance was taken prior to the study. General information such as name, age, gender etc was recorded. Pre-anaesthetic check (PAC), intraoperative and postoperative checks was done in the post-anaesthesia care unit (PACU). Electrocardiogram (ECG), and pulse rate, pulse oximetry, ETCO<sub>2</sub>, blood pressure and temperature was monitored. The incidence of the critical events was also recorded. Results thus obtained were subjected to statistical analysis using chi- square test. P value less than 0.05 was considered significant.

### RESULTS

Table I shows that out of 86 patients, males were 46 and females were 40. Table 2, graph 2 shows that common critical events were laryngospasm in 5, difficult neonatal intubation in 6, difficult mask ventilation in 10, accidental extubation in 2, bronchospasm in 7, hypercarbia in 2, bradycardia in 1 and IVC rupture in 4. The difference was significant (P< 0.05).

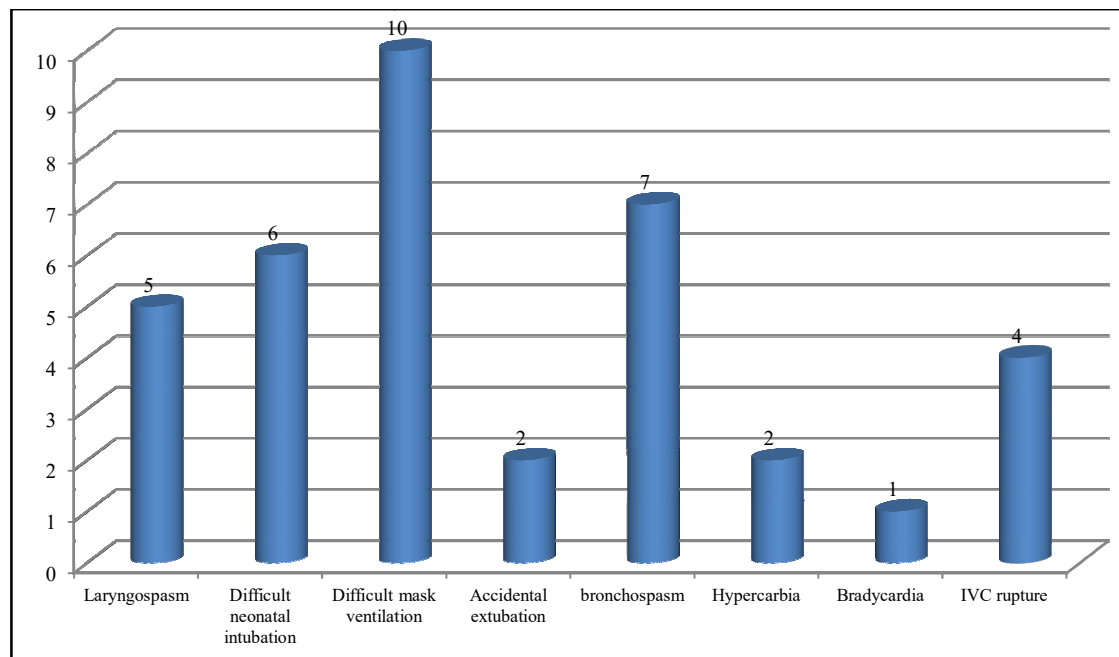
**Table 1: Age and gender-wise distribution of patients**

Parameter		Number of patients
Age years (group)	Less than 10	53
	More than 10	33
Gender	Male	46
	Female	40

**Table 2: Distribution of critical incidents**

Events	Number	P value
Laryngospasm	5	0.04
Difficult Neonatal Intubation	6	
Difficult Mask Ventilation	10	
Accidental Extubation	2	
Bronchospasm	7	
Hypercarbia	2	
Bradycardia	1	
IVC Rupture	4	

**Graph 1: Distribution of critical incidents**



## DISCUSSION

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).<sup>5</sup> 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. 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.<sup>6</sup> The present study was conducted to assess critical events in pediatric anaesthesia.

In this study, out of 86 patients, males were 46 and females were 40. Mittal et al<sup>7</sup> found that out of 1050 patients, 250 were neonates, 300 were infants, 340 were toddlers and 160 were other children. 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 1 case of reported death. Critical incidents occurred in less than 2 hours (68), 2-6 hours (44) and more than 6 hours (14). We found that common critical events were laryngospasm in 5, difficult neonatal intubation in 6, difficult mask ventilation in 10, accidental extubation in 2, bronchospasm in 7, hypercarbia in 2, and bradycardia in 1 and IVC rupture in 4. Cohen MM et al<sup>8</sup> found that cardiovascular incidents were

bradycardia seen in 7 patients, inferior vena cava rupture in 3 patients and accidental carotid punctures in 2 patients. Gupta S et al<sup>9</sup> found that degree of harm recorded was no harm in 8 patients, low harm (31), moderate harm (68), severe harm (18) and 1 case of reported death. Marcus R<sup>10</sup> also recorded maximum cases of moderate harm in her study.

Nurses and parents should be educated about care especially during positioning, changing clothes, physiotherapy and mobilization. One should reinforce difficult airway society guidelines where the call for help should be early, after the first failed intubation and further intubation attempts should be taken over by an experienced anaesthesiologist. IV lines should be kept accessible below the surgical drapes to facilitate regular checks for disconnection.<sup>11</sup> Dias R et al assessed the incidence of critical events in the paediatric operation theatre (OT). They conducted a prospective observational study of all children receiving anaesthesia in paediatric OT over a period of 1 year. They were monitored intraoperatively as well as postoperatively, and critical incidents were noted in terms of date and time of incident, location (OT/post-anaesthesia care unit, clinical category, age of patient, degree of patient harm resulting from the incident, description of what happened and duration of surgery. Percentage incidence of critical events was calculated. A total of 1206 children received an anaesthetic during the study. Incidence of critical events was 8.9% (108). Airway and respiratory events were the maximum recorded accounting for 60 (55%) incidents. There were 43 cases of oxygen desaturation out of which 21 were attributable to laryngospasm. Cardiovascular events were 12 (11.1%). Medication-related incidents were 4 (3.8%). Severe harm was reported in ten incidents, and 1 death was reported. A few uncommon incidents like change in voice following use of a cuffed endotracheal tube and post-operative acute renal failure requiring haemodialysis were noted. Incidence of critical incidents was almost one for every ten patients, and the audit helped us establish policy guidelines in our institution.<sup>12</sup>

## CONCLUSION

From the above results, the authors conclude that most critical events such as laryngospasm, difficult neonatal intubation, difficult mask ventilation, accidental extubation, bronchospasm, hypercarbia, bradycardia and IVC rupture. Therefore; further studies are recommended.

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