Anesthetic Practice and Perioperative Adverse Events in Pediatric Emergency Surgery: A Prospective Study of 522 Cases at a Moroccan University Hospital.

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Abstract

Background: Emergency pediatric anesthesia presents specific challenges related to age-dependent physiology, airway management, acute surgical disease, and limited time for preoperative optimization. This study aimed to describe anesthesia practices and perioperative adverse events in a pediatric emergency operating theatre.

Methods: A prospective, single-center descriptive study was conducted over 12 months at Abderrahim El Harrouchi Children's Hospital, Casablanca, Morocco. Children aged 1 day to 15 years undergoing emergency surgery were included. Demographic characteristics, surgical indications, anesthetic techniques, perioperative events, and postoperative outcome were summarized using frequencies and percentages.

Results: A total of 522 patients were included; 59.9% were male and 28.9% were younger than 1 year. Visceral and orthopedic emergencies accounted for 51% and 34% of procedures, respectively. Anesthetic induction was inhalational in 301 patients (57.7%) and intravenous in 221 (42.3%). Sevoflurane was used for maintenance in 474 patients (90.8%). Respiratory adverse events were reported in 177 patients (33.9%), hypothermia in 58 (11.1%), and cardiovascular adverse events in 34 (6.5%). Twelve postoperative deaths were reported (2.3%).

Conclusion: In this single-center emergency pediatric surgery cohort, respiratory events were the most frequently documented perioperative adverse events. The findings underscore the importance of systematic

airway assessment, temperature control, vigilant monitoring, and standardized event reporting. The observed postoperative mortality cannot be attributed to anesthesia without additional clinical data.

Keywords: pediatric anesthesia; emergency surgery; perioperative complications; respiratory adverse events; hypothermia; Morocco.

Introduction

Pediatric anesthesia requires age-adapted equipment, drug dosing, monitoring, and clinical decision-making. These requirements become more demanding in emergency surgery, where acute illness, possible non-fasted status, and restricted preparation time may increase complexity. Neonates and infants warrant particular attention because of limited physiological reserves, rapid oxygen desaturation, and vulnerability to hypothermia and cardiovascular instability.

Large observational studies have characterized perioperative critical events in children. In the European APRICOT study, severe critical events occurred in 5.2% of anesthetic procedures, with respiratory critical events accounting for 3.1% [1]. The NECTARINE study further demonstrated the burden of events requiring intervention in neonatal and early-infant anesthesia [2]. However, results from elective and mixed surgical populations cannot necessarily be extrapolated to a pediatric emergency operating theatre in a resource-constrained setting.

This study aimed to describe the demographic and surgical profile, anesthetic practices, perioperative adverse events, and reported postoperative outcomes among children undergoing emergency surgery at a Moroccan university children's hospital.

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Materials and Methods

Study design and setting

This prospective, observational, descriptive study was conducted over a 12-month period in the pediatric emergency operating theatre at Abderrahim El Harrouchi Children's Hospital, Ibn Rochd University Hospital, Casablanca, Morocco. Exact study dates: [to be completed from the original protocol].

Study population

Children aged from the first day of life to 15 years who underwent anesthesia for emergency surgery during the study period were eligible. Patients without a surgical emergency and those with unusable anesthesia records were excluded. The final analyzed cohort comprised 522 children. Whether recruitment was consecutive should be confirmed against the study protocol.

Data collection and variables

Data were obtained prospectively from anesthesia documentation. Variables available for this report included age category, sex, type of surgical emergency, route of anesthetic induction, inhaled agent used for maintenance, perioperative antibiotic exposure, reported respiratory and cardiovascular events, hypothermia, and postoperative outcome. The original records should be consulted to specify operational definitions for desaturation, bronchospasm, laryngospasm, suspected gastric aspiration, bradycardia, and hypothermia, as well as the exact period over which outcomes were assessed.

Statistical analysis

A descriptive analysis was performed. Categorical variables are presented as counts and percentages. Percentages were recalculated using 522 patients as the denominator when counts were available and rounded to one decimal place. Where only rounded percentages were reported in the

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source presentation, these were retained without assigning unverified exact counts. No inferential tests, risk-factor models, or causal analyses were conducted.

Ethical considerations

[Insert ethics committee approval or documented waiver, approval number and date, and the actual informed-consent arrangements applicable to the prospective study. Do not submit this paragraph with placeholders.]

Results

Patient characteristics and surgical emergencies

The study included 522 children. Male patients represented 59.9% of the sample (approximately 313 patients based on the reported rounded percentage), corresponding to a male-to-female ratio of approximately 1.49. Children aged from day 1 to 1 year formed the largest age group (28.9%). Visceral emergencies were the main surgical indication (51%), followed by orthopedic emergencies (34%). The remaining indications accounted for approximately 15% of procedures and were not further specified in the available summary.

Age category	**Reported proportion (%)**
Day 1 to <1 year	28.9
1–<3 years	15.9
3–<5 years	13.2
5–<10 years	24.9
10–15 years	17.1
Total	100.0

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Anesthetic techniques

Anesthetic induction was inhalational in 301 patients (57.7%) and intravenous in 221 patients (42.3%). Sevoflurane was the main volatile agent used for maintenance (474 patients; 90.8%), whereas isoflurane was used in 48 (9.2%). The source communication reported antibiotic prophylaxis in approximately 41% of patients and antibiotic therapy in 59%; the indications, timing, and possible overlap between the two categories require verification.

Anesthetic variable	n / 522	Percentage (%)
Inhalational induction	301	57.7
Intravenous induction	221	42.3
Sevoflurane maintenance	474	90.8
Isoflurane maintenance	48	9.2

Perioperative adverse events

Respiratory adverse events were reported in 177 of 522 children (33.9%), making them the most frequent category of event in the dataset. The source communication separately mentions desaturation, bronchospasm, laryngospasm, and events described as inhalation of gastric contents, but the precise definitions and subtype counts need to be recovered before presenting a breakdown. Hypothermia was documented in 58 children (11.1%). Cardiovascular adverse events were reported in 34 (6.5%), with bradycardia recorded in eight children (1.5%). Additional events reported in the presentation included confusion (approximately 7%) and vomiting (approximately 4%), without verified counts or timing.

Event / outcome	n / 522	Percentage (%)
Any reported respiratory event	177	33.9

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Hypothermia	58	11.1
Any reported cardiovascular event	34	6.5
Bradycardia (cardiovascular subtype)	8	1.5
Postoperative deaths (reported)	12	2.3

These event categories may overlap; their percentages should not be added. The respiratory event rate refers to the study's broad reported category and should not be interpreted as the incidence of severe respiratory critical events.

Postoperative outcome

A favorable postoperative outcome was reported in 510 of 522 patients (97.7%), whereas 12 deaths were recorded (2.3%). The observation window, causes of death, preoperative severity, and relationship of these deaths to anesthesia or surgery were not documented in the material available for this manuscript.

Discussion

This prospective descriptive study provides a snapshot of anesthetic practice in a pediatric emergency surgical service in Morocco. The principal findings were the high proportion of infants, widespread use of inhalational induction and sevoflurane maintenance, and frequent documentation of respiratory events. These data are useful for local quality improvement but require careful interpretation because adverse-event definitions and postoperative follow-up duration were not fully specified.

Almost three in ten children were younger than one year. This is clinically relevant because neonatal and infant physiology presents particular

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anesthetic challenges, including low functional residual capacity and limited tolerance of apnea. The NECTARINE study reported events requiring intervention during 35.2% of anesthetic episodes in patients up to 60 weeks postmenstrual age, illustrating the vulnerability of this youngest population [2]. Nevertheless, its event definitions and age selection differ from those of the present study; the rates should not be directly compared.

Inhalational induction was used in approximately 58% of cases, and sevoflurane predominated for maintenance. These findings describe local practice rather than indicating which induction strategy was safer. In emergency surgery, the anesthetic technique should be tailored to aspiration risk, venous access, hemodynamic status, airway characteristics, and clinical urgency. Because the available data do not stratify induction techniques by fasting status, age, pathology, or event occurrence, no association between induction route and complications can be established.

Respiratory events were the most common documented complications (33.9%). This figure substantially exceeds the 3.1% severe respiratory critical-event rate reported by APRICOT [1], but the difference should not be interpreted as a direct comparison of anesthetic safety. APRICOT applied a stringent definition requiring immediate intervention, whereas the present dataset appears to encompass a wider range of respiratory incidents. Likewise, possible aspiration events require confirmation of diagnostic criteria and timing. Studies of difficult pediatric airway management have shown that repeated intubation attempts are associated with complications, supporting preparation of age-appropriate airway equipment and early use of alternative techniques when indicated [3].

Hypothermia was reported in 11.1% of children. This result is broadly in the range of pediatric cohorts reporting perioperative hypothermia, including a prospective study that documented a rate of 12.1% and identified modifiable environmental and procedural factors [4]. Although definitions and temperature measurement methods were not available for the present cohort, temperature surveillance and active warming are

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reasonable targets for improvement, especially among infants and children requiring prolonged emergency operations.

Cardiovascular events were reported in 6.5% of patients, including bradycardia in 1.5%. However, no information was available on event severity, intervention, or association with baseline illness. The reported postoperative mortality of 2.3% should be interpreted as an overall outcome observed in this emergency surgical cohort, not as anesthesia-related mortality. Surgical pathology, physiological derangement before surgery, underlying disease, and length of follow-up are necessary to explain these deaths. Attribution requires case-level review.

This study has several limitations. It was conducted at a single center, and its descriptive design precludes identification of independent risk factors. The source presentation lacked explicit definitions for several adverse events, complete perioperative severity markers (such as ASA status), procedure-level characteristics, and a defined postoperative follow-up interval. Some percentages were only available in rounded form. These limitations may affect the precision and generalizability of the findings, but they also identify priorities for improved prospective data collection.

Future work should use standardized definitions of respiratory events, record neonatal and infant subgroups separately, collect ASA status and surgical urgency, document temperature measurement methods, and distinguish postoperative all-cause mortality from anesthesia-attributable complications. A structured morbidity review for serious events could help translate local observational data into safer care pathways.

Conclusion

In this prospective study of 522 children undergoing emergency surgery at a Moroccan university hospital, inhalational induction and sevoflurane maintenance were common. Respiratory events were the most frequently reported perioperative adverse events, followed by hypothermia and cardiovascular events. These findings highlight the value of systematic

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monitoring, age-adapted airway preparation, thermal protection, and standardized complication reporting in pediatric emergency anesthesia. Further detailed analysis is needed to clarify event severity and determinants of postoperative outcome.

Declarations

Ethics approval and consent to participate: [Confirm from original study documents].

Consent for publication: Not applicable to aggregated anonymized data, subject to institutional and journal requirements.

Funding: [Confirm whether the study received funding].

Competing interests: [Each author to confirm].

Authors' contributions: [Complete according to actual contributions].

Data availability: [Specify whether de-identified data can be provided upon reasonable request, subject to institutional approval].

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