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Pediatric Anesthesia Abstracts

Contents

Determining incidence and actionability of hypotension in pediatric patients in the operating room

AUTHORS

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INTRODUCTION

Intraoperative hypotension is common in pediatric anesthesia. In infants receiving general anesthesia under sevoflurane, 87% experienced mean arterial pressure (MAP) < 45 mm Hg, and 49% had MAP < 35 mm Hg, with 15% lasting over 15 min.[1] Risk factors for hypotension include lower weight, lower temperature, and regional anesthesia with intubation. Definitions of pediatric hypotension under anesthesia have varied, but sex- and age-specific reference values from de Graaff *et al*.[2] provide clearer benchmarks for intraoperative blood pressure. In adults, intraoperative hypotension is linked to adverse cardiac and cerebrovascular events, raising concerns about potential organ damage in children. However, recent studies show no long-term neurologic or renal effects in pediatric patients.[3,4] Hypotension prediction tools have been developed in adult anesthesia, with promising results regarding clinical utility in proactive management of hemodynamics.[5] No hypotension prediction tools have yet been developed for use in pediatric anesthesia.

METHODS

This observational, retrospective study aimed to identify hypotensive episodes in pediatric non-cardiac surgeries and examine the relationship between the degree of hypotension and clinician interventions. Research Ethics Board (The Hospital for Sick Children [SickKids]; #1000075896) approval was obtained. The study was conducted in the operating rooms of a major pediatric teaching hospital. The population included pediatric patients aged 0–18 undergoing non-cardiac, high-acuity surgeries, defined by the presence of arterial line pressure monitoring. Premature neonates were excluded. A hypotensive event was selected based on being below the defined numerical value for greater than continuous 30 sec. The arterial waveforms of hypotensive episodes were reviewed, and classified as true hypotension *vs* artifacts (Fig. 1). Contemporaneous clinician actions to treat hypotension were categorized into pharmacological (decreased anesthetic depth, vasopressors, inotropes), non-pharmacological (crystalloid, colloid, blood products), and other interventions. Comparisons were made between three definitions of pediatric hypotension based on systolic blood pressure: Pediatric Advanced Life Support (PALS) guidelines, de Graaff 1 standard deviation (S.D.), and de Graaff 2 S.D. This

approach aimed to provide a comprehensive understanding of hypotension incidence and management in high-acuity pediatric surgeries

RESULTS

Preliminary results and analysis identified a total of 4,098 systolic hypotensive episodes: 48.5% met PALS criteria, 31.1% met de Graaff 1 S.D. criteria, and 20.4% met de Graaff 2 S.D. criteria. Clinicians treated most hypotensive episodes (Fig. 2), particularly those classified as de Graaff 2 S.D. (88%), compared to PALS (83%) and de Graaff 1 S.D. (74.7%). Pharmacological treatments were most common, comprising 60% for PALS, 55% for de Graaff 1 S.D., and 59% for de Graaff 2 S.D. hypotension. The most frequently used interventions included reducing anesthetic depth, administering norepinephrine, and colloid (albumin), in similar order of frequency across hypotension criteria.

DISCUSSION

The findings demonstrate an association between hypotension severity and clinician intervention, with consistent treatment patterns across definitions. However, the lower treatment rate for de Graaff 1 S.D. hypotension was unexpected and warrants further investigation to identify contributing factors. These results guide the next stage in this series of work: the development of a hypotension prediction model for pediatric anesthesia and will support its application to larger datasets. This work aims to improve the understanding and management of intraoperative hypotension, enhancing the safety and quality of pediatric anesthesia care.

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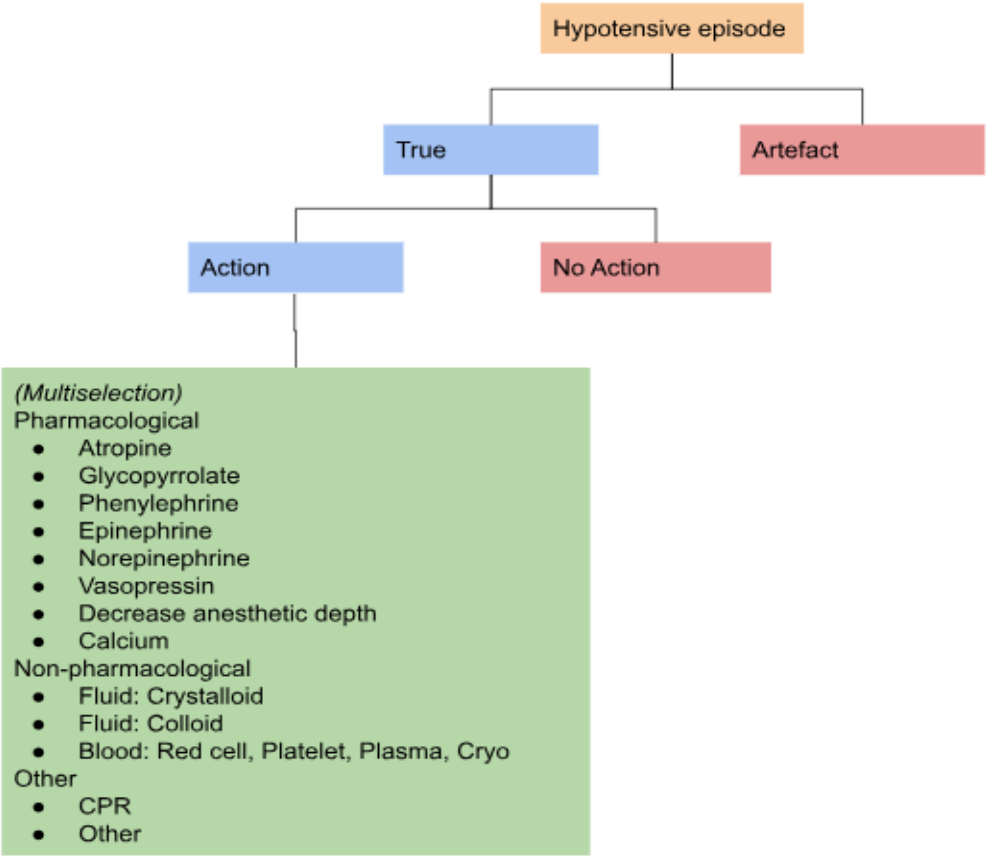**Fig. 1** Decision tree in review of hypotensive episodes

Fig. 2 Comparison of proportion of clinician actions to treat different hypotension criteria