



# **Common Perioperative Concerns in Pediatric Anesthesia: A Literature Review**

**Wael Waheed Mohamed <sup>a\*</sup>**

<sup>a</sup> *Burjeel Hospital, Abu Dhabi, UAE.*

**Author's contribution**

*The sole author designed, analysed, interpreted and prepared the manuscript.*

**Article Information**

DOI: 10.9734/AJRIMPS/2023/v12i4227

**Open Peer Review History:**

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/105655>

**Review Article**

**Received: 19/06/2023**  
**Accepted: 25/08/2023**  
**Published: 26/08/2023**

## **ABSTRACT**

There are several disorders that require children to be anesthetized. Sometimes, it is due to the non-cooperation of the children that requires them to be put under sedation for a procedure that is necessary for them, while at other times, it is because of any indicated surgical procedure that they have to go through, that they are put under anesthesia. However, unlike adults, children particularly the pediatric populations have particular demands and requirements that make them special candidates for receiving the required anesthesia. In children, nearly all parameters are different anatomically, physiologically, pharmacologically, and psychologically.

According to some recent studies, it has also been noted that there are significant adverse events that are linked with the induction of anesthesia in the pediatric population, that are bound to arise if care is not taken during or after the anesthesia. These problems could arise in lieu of several factors such as the choice of anesthetic, the mode of anesthesia, airway management, and the reversal of anesthesia. In all cases, it is better to avoid the risk of complications and adverse events by making sure that only the most competent and expert of all staff are involved in the anesthesia team. With proper care and management of anesthesia, it is obvious that the risk of any

\*Corresponding author: E-mail: [drwaelwaheedmohamed@gmail.com](mailto:drwaelwaheedmohamed@gmail.com);

critical events would be comparatively much less and that the children could be operated on easily. This review aims to deal with certain problems that arise in the background of anesthesia induction in the pediatric population. The age group that is referred to here belongs neonates to up to thirteen years of age. This review will explore the causes that result from the induction of anesthesia in such populations.

*Keywords: Anesthesia; pediatric; pediatric surgery; local anesthesia; general anesthesia; complications of anesthesia.*

## 1. INTRODUCTION

In the developed and advanced world of medical science today, pediatric anesthesia is now recognized as a separate subspecialty because of the scope and vastness of this field as an individual area of interest. It is mainly because of the special care, requirements, and demands of this particular population of interest that has forced doctors and anesthesiologists to wonder upon this field from all perspectives to make sure that all children receive safe and effective induction of anesthesia for their required procedures [1].

Since children, particularly the pediatric populations are already in their complex phases of growth, it is important to note that they have specific demands in terms of their anatomy, physiology, psychology (both social and emotional), and pharmacology [2].

Therefore, keeping all these factors is of utmost importance when it comes to inducing, maintaining, and reversing anesthesia in the pediatric population. There have been several instances that required immediate resuscitation or interventions from the anesthesiologists due to the development of critical events in the wake of anesthesia. Cardiovascular problems have been the leading cause behind instabilities in pediatric anesthesia, although there has been involvement of several other factors as well [3].

Moreover, it was also concluded that in children less than 3 years of age and in those having an ASA Physical Status of more than 3, there is a considerably higher risk of developing adverse events related to anesthesia. It is because of reasons like these that people are advised to consult specialist anesthesiologists for pre-operation assessment of their children [4,5].

Over the span of the last five decades, the pursuit of patient safety within the broad scope of anesthesiology has yielded remarkable results. The mortality rate, once standing at a troubling 1 in 2500 cases, has diminished to a far more

reassuring 1 in 13,000 cases. Notably, this drive for higher safety and efficacy has extended its embrace towards the delicate domain of pediatric anesthesiology, where its impact has been profound [6].

In this specialized field, the aspiration to safeguard children undergoing medical procedures has been met with resolute determination.

## 2. PERIOPERATIVE ASSESSMENT FOR SAFE PEDIATRIC ANESTHESIA

There are several important factors that need to be considered when opting for pediatric anesthesia. The main factors that judge the safety and effectiveness of pediatric anesthesia are airway, cardiovascular, and medication errors. Now, there are several large-scale networks, particularly the Pediatric Regional Anesthesia Network and the Pediatric Craniofacial Collaborative Group, that allow the study of such patients to make sure that the outcomes for each patient are noted and forwarded ahead for future reference [7].

Central to the tapestry of patient safety is the crucial hand-off process. This pivotal juncture, where the intensive care unit relinquishes responsibility to perioperative care, hinges upon the effective exchange of patient information. The stakes are high, for any oversight during this transition can imperil patient well-being. In the realm of pediatric anesthesiology, these initiatives collectively stand as a testament to the unyielding commitment to the safety and well-being of the most vulnerable among us [8].

Regarding the preparation and preparedness of the children and their families for anesthesia, a study was carried out at the Alberta Children's Hospital. A team was arranged to ask and understand the anxieties and concerns of families whose children were scheduled for surgery. It was vital that for accurate information

and first-hand experiences, no one except for the family of the patients would be able to give truthful, honest answers [9].

Through surveys and conversations, the team engaged with these families, asking them about their feelings of preparedness leading up to their child's surgery. The responses showed a pattern that revealed the significance of in-person programs in boosting the families' sense of readiness. When families participated in these face-to-face sessions, they reported feeling more equipped to handle the upcoming surgical procedure. This elaborates and shows that counseling and proper guidance regarding the procedure was what drove the parents to give consent for their children's anesthesia [10].

However, the team also recognized the potential for further improvement. Families expressed a desire for additional resources that could be accessed online. The convenience and accessibility of online platforms were appealing to many, and families believed that having resources readily available at their fingertips could alleviate some of their concerns.

Armed with these invaluable insights, the team set to work. Drawing upon their expertise and the feedback they received, they crafted an innovative solution—a comprehensive online program. This program aimed to bridge the gap between the beneficial in-person sessions and the convenience of online resources. It encompassed a range of information, offering families detailed explanations about the surgical process, potential outcomes, and ways to prepare their child for the experience [11].

### **3. PROBLEMS ENCOUNTERED DURING PEDIATRIC ANESTHESIA**

Despite taking several measures to avoid problems and unwanted adverse events, children still seem to come under the radar and develop some complications. In other cases, these children might also become a source of hindrance to giving safe anesthesia. Some of the most common problems that are faced by pediatric patients during induction of anesthesia are as follows:

#### **3.1 Inappropriate Drug Dosage Calculation**

In all forms and modes of anesthesia, the dosage of the drug continues to be a problem. There are

several instances where a particular drug is not seen to cause the desired impacts in a given patient and so, the dose needs to be adjusted or recalculated accordingly. In other patients, there could be a risk of disturbances in the metabolic components of a child if the dose of the anesthesia gets either too concentrated or diluted. There is also a risk of overdosage associated with all forms of anesthesia. Therefore, it is best to leave the calculation of the appropriate anesthetic drug to the expert, who knows better what to give for the induction and maintenance phases [12].

#### **3.2 Fluid Management**

A very important aspect of pediatric anesthesia is the management of fluids once the child has woken up from the anesthesia. Fluid management in children after anesthesia involves closely monitoring and maintaining the right balance of fluids and electrolytes to prevent complications and promote healing. Anesthesiologists and healthcare providers keep a close eye on the child's vital signs, including heart rate, blood pressure, and urine output, to assess their fluid status. Pediatric guidelines provide recommendations on how much fluid a child needs post-anesthesia to prevent dehydration or over-hydration [13].

Depending on the child's condition and the type of surgery, they may be allowed to resume oral intake (drinking and eating) within a certain timeframe after anesthesia. This helps restore hydration levels to normal.

Moreover, surgery and anesthesia can sometimes lead to electrolyte imbalances, so healthcare providers monitor these levels and make adjustments as needed. If signs of dehydration or fluid overload are detected, healthcare providers intervene promptly by adjusting fluid intake, and electrolyte composition, or administering medications if necessary. Some children may experience postoperative nausea and vomiting (PONV), which can affect their fluid intake. Managing PONV effectively is essential to ensure the child can tolerate oral intake and maintain hydration [14].

#### **3.3 Problems With Airway Management**

As compared to adults who are mature and have strong bodies, the pediatric body is still in a phase of growth. Their airway, particularly the

trachea, is smaller in size and could pose a risk while intubating. All this is very difficult to deal with and could turn into a life-threatening situation if any problems arise during the intubation process. Similarly, not all hospital setups are well-equipped with all the machinery and equipment that is required for the maintenance of anesthesia under any and all circumstances. These could be other hindering factors in letting safe and effective anesthesia prevail [15].

### 3.4 Hemodynamic Instability

Since the pediatric body is seen to be in a complex state of development, it is evident that there could be exaggerated or more pronounced results of certain drugs and their actions. Using any drug for the purpose of anesthetizing the patient could lead to an increased or decreased heart rate, abnormal respiratory rate, and breathing difficulties. If these conditions prevail, then it is possible that the patient could have to face life-threatening consequences with this drug as well. Therefore, it is very essential for the anesthetist to gain a proper assessment of the child's vital signs before the anesthesia is induced. Close monitoring and quick interventions are seen to greatly help reverse any potential life-threatening impacts [16].

### 3.5 Temperature Irregularities

Anesthesia and hypothermia have been seen to have a close relationship. For avoiding this, especially in the pediatric populations, warmers are frequently used. However, there have been several instances of children experiencing hypothermia because they have a larger surface area as compared to their body masses. In any kind of hypothermia, the child could experience wound-healing disturbances, coagulation disorders, and certain hemodynamic instabilities as well [17].

### 3.6 Delirium

It is a general observation that when anesthesia is reversed, many patients arouse with a certain delirium. This is a state of being confused, agitated, and disoriented [18]. Children might be increasingly confused and agitated when it comes to waking them up after the anesthesia. There could be possible consequences to it as well. Therefore, one parent or attendant must accompany the child at all times to make sure that they are not feeling out of place or lonely in

the otherwise scary environment of the hospital and the operation theatre [19].

Although avoidable, all these problems could prove to be very debilitating for the patient. However, the parents of the children could also get increasingly tensed and frustrated because of their children's condition. It could then become difficult for the attending doctors and surgeons to deal with the problems at hand. However, with the appropriate care and management, all these problems could be avoided for the better.

## 4. CONCLUSION

Pediatric anesthesia is a complex and complicated process. It requires the right kind of guidance and expertise to induce it effectively. However, with the pediatric population being an already vulnerable one, there are several problems that could arise in its background. Problems such as hemodynamic instability, fluid disturbances, allergies, pain, and airway management problems, all give rise to complications in the long run. To avoid these problems, it is better to inform the parents about what to expect after the surgery. This way, they could be prepared in a much better manner to deal with any possible complications with their children.

## CONSENT AND ETHICAL APPROVAL

It is not applicable.

## COMPETING INTERESTS

Author has declared that no competing interests exist.

## REFERENCES

1. Tesoro S, Marchesini L, De Robertis E. Pediatric anesthesia. *Transl Med UniSa*. 2019;12(20):1–3.
2. Walters C. Pediatric anesthesiology special issue. *Children*. 2021;8(3):201.
3. Wu JP. Pediatric anesthesia concerns and management for orthopedic procedures. *Pediatr Clin North Am*. 2020;7(1):71–84.
4. Feehan T, Packiasabapathy S. Pediatric regional anesthesia. In: *StatPearls [Internet]*. Treasure Island (FL): StatPearls Publishing; 2023. Available:<http://www.ncbi.nlm.nih.gov/books/NBK572106/>

5. ReeceNguyen TL, Lee HH, Garcia-Marcinkiewicz AG, Szolnoki J, Fernandez AM, Mukkamala S, et al. Diversity, equity, and inclusion within the society for pediatric anesthesia: A mixed methods assessment. *Paediatr Anaesth.* 2023; 33(6):435–45.
6. van der Griend BF, Lister NA, McKenzie IM, Martin N, Ragg PG, Sheppard SJ, et al. Postoperative mortality in children after 101,885 anesthetics at a tertiary pediatric hospital. *Anesth Analg.* 2011;112(6):1440–7.
7. Ahmed Z, Rufo PA. Pediatric preoperative management. In: *StatPearls [Internet]*. Treasure Island (FL): StatPearls Publishing; 2023. Available:<http://www.ncbi.nlm.nih.gov/books/NBK559198/>
8. Dave NM. Premedication and induction of anaesthesia in paediatric patients. *Indian J Anaesth.* 2019;63(9):713–20.
9. Newell C, Leduc-Pessah H, Bell-Graham L, Rasic N, Carter K. Evaluating and enhancing the preparation of patients and families before pediatric surgery. *Children.* 2020;7(8):90.
10. Ruby JM, Illescas A, Zhong H, DelPizzo KR, Poeran J, Liu J, et al. Pediatric anesthesia practices during the COVID-19 pandemic: A retrospective cohort study. *Health Sci Rep.* 2022;6(1):e979.
11. Ponde V. Recent trends in paediatric regional anaesthesia. *Indian J Anaesth.* 2019;63(9):746–53.
12. Kaufmann J, Laschat M, Wappler F. Medication errors in pediatric emergencies. *Dtsch Arztebl Int.* 2012;109(38):609–16.
13. Kight BP, Waseem M. Pediatric fluid management. In: *StatPearls [Internet]*. Treasure Island (FL): StatPearls Publishing; 2023. Available:<http://www.ncbi.nlm.nih.gov/books/NBK560540/>
14. Mathew A, Rai E. Pediatric perioperative fluid management. *Saudi J Anaesth.* 2021;15(4):435–40.
15. Harless J, Ramaiah R, Bhananker SM. Pediatric airway management. *Int J Crit Illn Inj Sci.* 2014;4(1):65–70.
16. Lee EP, Lin JJ, Hsia SH, Chan OW, Jan SL, Wu HP. Cutoff values of hemodynamic parameters in pediatric refractory septic shock. *Children.* 2022;9(3):303.
17. McCabe SM, Abbiss CR, Libert JP, Bach V. Functional links between thermoregulation and sleep in children with neurodevelopmental and chronic health conditions. *Front Psychiatry.* 2022 14;13:866951.
18. Useinovic N, Jevtovic-Todorovic V. Controversies in anesthesia-induced developmental neurotoxicity. *Best Pract Res Clin Anaesthesiol.* 2023;37(1):28–39.
19. Lin N, Liu K, Feng J, Chen R, Ying Y, Lv D, et al. Development and validation of a postoperative delirium prediction model for pediatric patients. *Medicine (Baltimore).* 2021;100(20):e25894.

© 2023 Mohamed; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

*Peer-review history:*  
The peer review history for this paper can be accessed here:  
<https://www.sdiarticle5.com/review-history/105655>