



## New Insights into Perioperative Fluid Management for Children with Shifting Paradigms in Pediatric Anesthesia

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Fluid management in pediatric anesthesia has been a topic of ongoing research and debate. Recent studies have provided valuable insights into optimizing perioperative fluid therapy in children.

### Maintenance fluids

Traditionally, pediatric maintenance fluids have been calculated using the Holliday-Segar formula, which is based on studies conducted on healthy children over 70 years ago. However, recent evidence suggests that this approach may not be optimal for all pediatric patients.

A review by Mathew and Rai found that using isotonic solutions with appropriate potassium chloride and dextrose for maintenance fluids significantly decreases the risk of developing hyponatremia in pediatric patients [1]. Current recommendations suggest restricting total volume infusion to 50% of isotonic solutions with a glucose requirement of 1–2.5% [1].

### Preoperative fasting

Preoperative fasting times have been a subject of debate, with concerns about the potential risks of prolonged fasting in children. A review recommends that preoperative fasting times should be minimized, with clear fluids allowed up to 1 hour before surgery [2]. The authors encourage children to drink clear fluids up until 1 hour before induction [2].

### Intraoperative fluid management

Intraoperative fluid management strategies vary depending on the type and duration of the surgical procedure. For minor procedures lasting less than 1 hour, balanced isotonic fluids without glucose can be given up to a maximum of 10 ml/kg/hr [1]. For in-

termediate and major procedures, the balanced isotonic infusion should be adjusted according to requirements during surgery, and glucose in a lower concentration (1-2.5%) can be added if needed [1].

Colloids can be considered if additional fluids are required after isotonic fluid boluses (10-20 ml/kg) [1]. A review by Boneva, et al. found that the preferred synthetic colloid for children is a third-generation hydroxyethyl starch (HES) in a balanced solution [4].

### Postoperative fluid management

Postoperative fluid management aims to compensate for ongoing body fluid loss and free water retention. Children should start drinking fluids as early as possible after anesthesia, based on their urge to drink [4]. When early oral intake is not possible or insufficient, IV fluid support is essential to maintain normovolemia [5].

The postoperative maintenance solution should be isotonic and isonatremic to minimize the risk of iatrogenic hyponatremia [5]. A review by Goldschneider, et al. emphasizes the importance of using isotonic solutions to prevent the development of hyponatremia in pediatric patients [4].

### Hemodynamic monitoring

Accurate hemodynamic monitoring is crucial for guiding fluid therapy in pediatric patients. A narrative review by Beels, et al. found that respiratory variation of aortic blood flow peak velocity ( $\Delta V_{peak}$ ) with echocardiography is currently the most reliable technique for evaluating fluid responsiveness in children [2]. Bioimpedance monitoring is also a promising non-invasive technique for assessing fluid status in pediatric patients [2].

In conclusion, recent research emphasizes the use of isotonic maintenance fluids, minimizing preoperative fasting, and using advanced hemodynamic monitoring techniques to optimize fluid management in pediatric anesthesia. Careful consideration of the child's specific needs and perioperative factors is crucial for providing safe and effective fluid therapy. As research continues to evolve, anesthesiologists must stay up-to-date with the latest evidence-based practices to ensure the best possible outcomes for their pediatric patients.

### Bibliography

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