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Review Article

Pre-procedural Fasting

Striking the Right Balance: A Review of Pre-procedural Fasting Protocols and their Impact on Pediatric Patients

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Introduction: Preoperative fasting guidelines have evolved from Sir Joseph Lister's 1883 recommendations to more flexible protocols such as the 1999 American Society of Anaesthesiologists' 6-4-2 rule and 2022 6-4-1 regimen. Despite these updates, outdated practices still lead to prolonged fasting and related complications.

Aim: This scoping review evaluates current preoperative fasting protocols for Pediatric patients, assesses their impact on outcomes, and identifies areas for improvement to balance aspiration risks with the adverse effects of prolonged fasting.

Methodology: An orderly search was conducted across PubMed, Scopus, Science Direct, etc., (up to June 10, 2024) using Boolean operators and keywords like "pre-procedural fasting," "protocols," "children," and "influencing factors" to select relevant studies based on inclusion criteria.

Results: Prolonged fasting, sometimes up to 16 hours, causes discomfort and increases risks of hypotension, nausea, and hypoglycemia. Challenges include outdated practices, unpredictable surgical schedules, and communication gaps, leading to non-compliance and cancellations. Modern guidelines balance benefits and risks by incorporating a better understanding of gastric emptying and child comfort.

Conclusion: Optimizing preoperative fasting for pediatric patients requires flexible protocols, enhanced family education, and improved healthcare team coordination. Continued research and a multidisciplinary approach are essential for refining practices, improving outcomes, and increasing satisfaction.

Keywords: Pre-procedural fasting, fasting protocols, Influencing Factor, Pediatric patients, Perioperative care

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Introduction

Preoperative fasting guidelines have evolved significantly since Sir Joseph Lister's early recommendations in 1883 aimed to mitigate aspiration risks by limiting solid food intake and permitting only small amounts of clear fluids.[1] Managing pediatric patients undergoing surgery requires careful preoperative fasting to prevent aspiration—an issue exacerbated by the depression of laryngeal reflexes during anesthesia.[2] This reflex commonly guards against aspiration, but its suppression increases risk of aspiration, thus necessitating reduced stomach contents' acidity and volume [3,4].

The debate surrounding preoperative fasting for pediatric surgeries involves balancing the risk of aspiration against the adverse effects of prolonged fasting [5]. Traditionally, nil per os (NPO) after-midnight practice required children to fast from all food and liquids after midnight [6,7,8]. However, 1999 American Society of Anaesthesiologists (ASA) guidelines marked a shift towards more flexible fasting protocols with introduction of 6-4-2 rule, which allows clear fluids up to 2 hours before surgery, breast milk up to 4 hours, and solid foods up to 6 hours [1,3,9].

The 6-4-1 regimen, introduced in 2022, further shortens fasting period for clear fluids [10]. Recent guidelines from European Society of Anaesthesiology and Intensive Care and Association of Paediatric Anaesthetists of Great Britain and Ireland (APAGBI) recommend permitting clear fluids up to 1 hour before anesthesia. At same time, solid foods and breast milk should be fasted for 6 hours and 4 hours, respectively [5,11]. These updates acknowledge that clear liquids empty from stomach more quickly than solids [6].

Despite updated guidelines, many children still endure fasting durations of up to 16 hours [12], leading to non-compliance and same-day cancellations despite preoperative education [13]. Many healthcare facilities must improve their practices, resulting in unnecessarily prolonged fasting times for pediatric patients [7,14]. Prolonged fasting can cause significant discomfort and complications, including hypotension, nausea, and hypoglycemia [14,15]. It also exacerbates thirst, hunger, and metabolic stress, particularly in children with limited glycogen reserves, and is associated with decreased patient and family satisfaction [5,8,10,16,17]. This issue is particularly pronounced for those scheduled for afternoon surgeries [18].

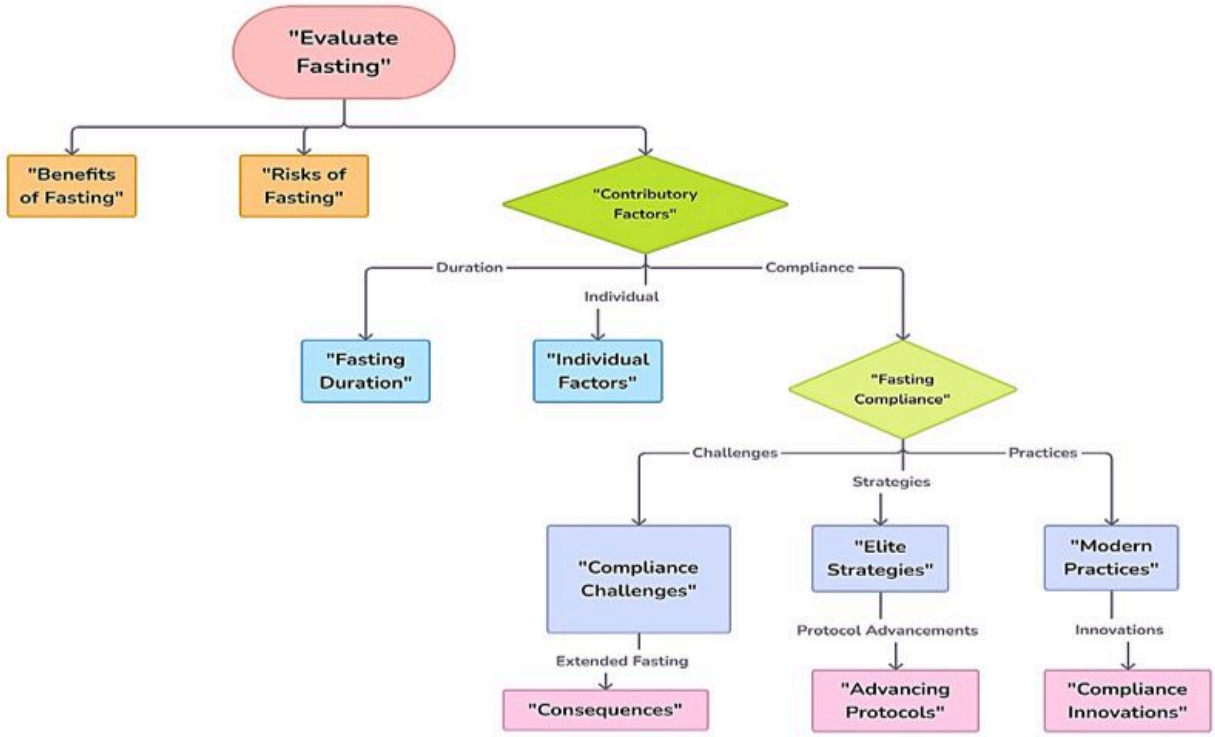

Figure 1: Conceptual Framework for Evaluating Preoperative Fasting Protocols and Their Impact on Pediatric Patient Outcomes

Adherence to fasting guidelines is often challenged by unpredictable surgical schedules, communication gaps between healthcare providers and parents, and varying levels of family understanding [3]. Misunderstandings, parental pressure, and inconsistent medical advice further contribute to non-compliance [12]. Despite Enhanced Recovery After Surgery (ERAS) protocols, outdated practices persist due to logistical, cultural, and traditional factors [18,19]. This review explores current preoperative fasting protocols and their impact on pediatric patient outcomes, highlighting the need for continuous efforts to strike an optimal balance in fasting practices. To explain the same, Figure 1 will depict the conceptual framework that was self-designed to explain Pre-procedural Fasting Protocols and their Impact on Pediatric Patients.

Objective

This scoping review aims to provide insights into the crucial issue of pre-procedural fasting protocols for pediatric patients. It examines current pre-procedural fasting practices and their impact on pediatric well-being. By synthesizing existing research and identifying areas for improvement, this review seeks to guide the development of evidence-based fasting protocols that prioritize the safety and well-being of pediatric patients undergoing surgery.

Methods and search strategies

This review employs a systematic search strategy across five reputable databases (PubMed, Scopus, Science Direct, Research Gate, and Google Scholar). With the last search conducted on June 10th, 2024, we identified relevant studies using Boolean operators and keywords encompassing "pre-procedural fasting," "protocols," "children," and "influencing factors." Inclusion criteria encompassed studies including pediatric age group involving pre-procedural fasting, published in English with full-text accessibility. A detailed selection process outlined in *Figure 2* will ensure the inclusion of studies directly investigating the impact of fasting protocols on pediatric patients.

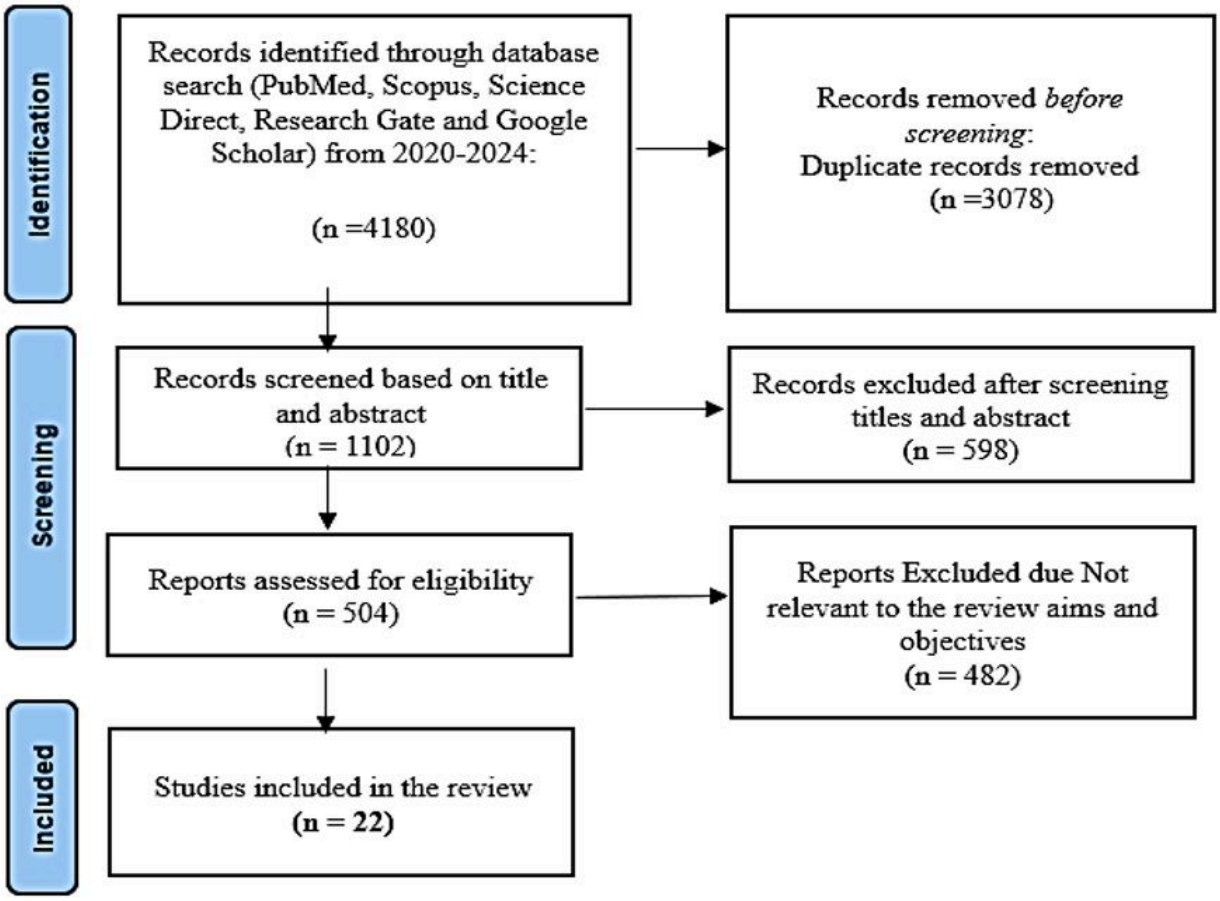

Figure 2: Schematic representation of search strategy for literature review

Results

Evaluating Preoperative Fasting: Benefits, Risks, and Contributory Factors

Preoperative fasting reduces aspiration risk and ensures a more precise surgical field [11]. Still, it also presents risks such as hunger, thirst, dehydration, hypoglycemia, and increased anxiety, particularly in pediatric patients. These risks are influenced by fasting duration, age, health conditions, and procedure type [4,11]. Malnutrition from fasting can lead to complications, more extended hospital stays, and higher care costs [20].

The impact of fasting varies with age and timing, as younger children and those having afternoon surgeries experience more hunger [15]. Fasting also affects blood glucose and systolic blood pressure based on age and body weight [14]. Adverse events related to aspiration are mainly seen in patients fasting beyond the recommended 88 to 120 minutes, suggesting that patient-specific factors are more critical than fasting duration alone [5].

Younger age and later surgery times predict adverse events, with infants being particularly vulnerable. Scheduling high-risk surgeries earlier and proactive fluid intake can reduce complications [5]. Delays and scheduling issues can extend fasting times and discomfort, making improved scheduling practices essential [17]. While aspiration risk is higher during emergency procedures, studies show no significant difference in harm compared to elective procedures, indicating the need for balanced fasting guidelines [2].

Thus, carefully evaluating benefits and risks is crucial for optimizing safety, comfort, and recovery.

The Impact of Fasting Duration and Individual Factors on Pediatric Preoperative Care

Various individual factors, such as gastrointestinal motility, medical conditions, and drug use, critically influence fasting duration in pediatric preoperative care. These factors necessitate customized fasting protocols to effectively manage the risk of pulmonary aspiration [11].

Research has shown that personalized fasting protocols reduce perioperative fasting times and enhance comfort for infants and young children without increasing the risk of postoperative complications [17].

Despite the generally low risk of severe outcomes from pulmonary aspiration, allowing clear fluids closer to the procedure can decrease fasting times and related discomfort without significantly elevating aspiration risk [1].

However, notable variability in gastric emptying rates complicates fasting guidelines. Studies using ultrasound and MRI reveal a range of gastric emptying times, from 4 hours for a light breakfast to a variable half-life of 18 to 48 minutes for clear fluids, highlighting the impact of individual factors beyond fasting duration [21].

Current preoperative fasting guidelines recommend minimal fasting periods of 1 to 2 hours to reduce symptoms such as crying, thirst, and anxiety while maintaining safety. Nevertheless, adherence to these guidelines must be more consistent due to traditional practices and scheduling challenges [20].

Furthermore, extended fasting can disrupt glucose levels, leading to potential complications like hypoglycemia. Glucose management during anesthesia is hindered by inconsistent glucometer availability and inadequate data on hypoglycemia, occasionally resulting in unmonitored glucose administration [22].

Such tailored approaches can improve patient comfort and outcomes while managing associated aspiration and glucose imbalance risks.

The Consequences of Extended Fasting in Pediatric Patients

Extended fasting periods before procedures in pediatric patients can significantly impact their health and comfort, leading to complications and adverse effects. Prolonged fasting is commonly associated with increased hunger and thirst, contributing to discomfort and psychological stress [15]. Prolonged fasting often leads to physiological issues such as hypoglycemia, dehydration, and electrolyte imbalances, which may worsen postoperative nausea, vomiting, and hypotension. [9,14,17]

The discomfort associated with extended fasting, especially involving liquids, emphasizes the need for optimized fasting protocols to minimize adverse outcomes. Evidence shows that shorter fasting times, particularly for clear liquids, can alleviate patient discomfort without heightening the risk of aspiration. [6]

The discrepancy between recommended and actual fasting durations highlights the urgent need for better adherence to established guidelines. Prolonged fasting can lead to biochemical imbalances and increased insulin resistance, which is especially concerning for young children with limited glycogen reserves [7,9,17,18,19, 21,22]. Excessive fasting can cause significant discomfort and exacerbate hemodynamic instability, affecting pediatric patients and their families [8,12].

Specific special populations, such as children with traumatic injuries or preterm infants, present additional complexities. For instance, children with limb or facial injuries may retain gastric contents longer than anticipated, even after extended fasting. Preterm infants may experience slightly delayed gastric emptying, although specific guidelines for this population remain under development [21].

Healthcare institutions face financial strains from idle operating rooms and increased overtime expenses. Families also experience emotional stress, including anxiety and lost workdays, due to these disruptions [13].

Addressing the conflict between fasting duration and intake volume is essential for developing consistent and universal guidelines that balance safety and patient comfort. Clear communication from healthcare providers is crucial to ensure adherence and minimize complications related to extended fasting periods [4,12].

Challenges in Pediatric Preoperative Fasting Compliance

Implementing updated fasting guidelines in pediatric care poses several challenges, mainly due to organizational constraints, adherence to outdated practices, and the unique needs of individual patients. Disruptions to established schedules and practices often occur, necessitating a careful approach to align with the latest recommendations [11,15]. Multidisciplinary communication plays a crucial role in the success of fasting programs and in enhancing adherence. Methods such as sending text message reminders to parents have been explored to improve compliance with fasting protocols. Despite clear guidelines like the 6-4-2 rule, discrepancies between recommended and actual fasting times are typical, often due to miscommunication and lack of adherence [9].

Accurate scheduling and coordination among medical teams—including admissions, operating rooms, and anaesthesiology—are essential to avoid extended fasting periods and ensure timely preoperative care [17]. Parental understanding is another critical factor influencing compliance. Many parents mistakenly believe that longer fasting times lead to better anesthetic outcomes, which results in unnecessarily prolonged fasting. Enhancing education and communication is necessary to align parental practices with established guidelines [7,17]. Gaps in parental knowledge often lead to prolonged fasting, so improving verbal and written information is essential for optimizing fasting durations and reducing anxiety [10]. Younger parents and those who receive clear instructions are more likely to follow guidelines, although parental educational level does not significantly impact compliance [12].

Despite advancements in fasting guidelines, challenges persist due to multicultural considerations, educational gaps, and logistical issues. Non-compliance and misunderstandings frequently lead to postponed procedures and potential safety issues [1,18]. Unpredictable operating room schedules and poor communication between healthcare staff and parents often contribute to noncompliance with fasting guidelines. Additionally, misunderstandings or lack of awareness about fasting requirements among parents can lead to both intentional and unintentional violations [3]. Factors such as patient age, ethnicity, language barriers, insurance type, the nature of the surgical procedure, and conflicting advice from healthcare providers also contribute to non-compliance [13].

Socioeconomic, cultural, and logistical factors contribute to adherence issues, with some hospitals continuing outdated practices. Education and targeted materials are necessary to promote compliance and ensure appropriate nutritional practices [19,20]. Research should focus on bridging gaps in understanding and developing improved educational strategies for managing preoperative fasting in pediatric patients [14]. Addressing these challenges is crucial for optimizing preoperative care and ensuring that fasting practices are practical and aligned with current guidelines. Effective communication and coordination between anesthetists and surgeons and clear written instructions can improve adherence.

It is essential to employ clear, repeated verbal, written, and multimedia communication to ensure that families understand and adhere to fasting guidelines.

Advancing Pediatric Preoperative Fasting Protocols: Elite Strategies, Modern Practices, and Compliance Innovations

Effective preoperative fasting protocols are essential for minimizing risks and optimizing outcomes in pediatric patients. By adopting evidence-based strategies, healthcare providers can balance ensuring patient safety and addressing nutritional needs, thereby refining practices to enhance patient comfort and improve overall care.

A significant advancement in preoperative fasting for pediatric patients is the adoption of protocols allowing clear fluids up to one hour before anesthesia. This approach has significantly improved patient comfort and satisfaction, reducing distress and enhancing well-being compared to more extended fasting periods. Such practices minimize physiological stress and provide a more comfortable induction process [10].

However, preoperative fasting practices must be more consistent, with variations observed between inpatient and outpatient settings. Inpatients who are at higher risk of hypoglycemia due to invasive procedures and pre-existing conditions face different challenges compared to outpatients, who generally encounter fewer complications [22].

Addressing these challenges requires flexible fasting protocols, improved scheduling, and enhanced communication to meet pediatric needs [11].

A multidisciplinary approach and quality improvement strategies are critical for aligning fasting practices with established guidelines. This includes adjusting electronic health records, ensuring adequate calorie intake, and employing psychological distraction techniques. Nonetheless, potential biases in self-reported data and variations based on surgical schedules must be considered [8,12,15].

Early refeeding post-surgery has demonstrated safety and feasibility, alleviating hunger and discomfort without increasing complications such as vomiting or bloating. This strategy enhances both parental satisfaction and child comfort [17].

The complexity of fasting recommendations is further compounded by variations in gastric emptying depending on the type of food and fluid consumed. For example, breast milk and whey-based formulas empty faster than cow's milk [4]. Addressing these issues necessitates improved communication and adherence to updated guidelines. Strategies such as better scheduling, enhanced staff and parental education, and improved communication with surgical theatres are essential [21]. Additionally, the risk of hypoglycemia varies with fasting duration and preoperative maintenance fluids, with fasting after morning meals potentially reducing this risk compared to overnight fasting [22].

Targeted interventions, including identifying at-risk groups and providing multilingual resources, are crucial for improving compliance and fasting practices [13]. Innovative methods, such as using gastric ultrasound for assessing gastrointestinal comorbidities, could enhance risk assessment and reduce aspiration-related complications [2]. Current solutions like dextrose-containing intravenous fluids have yet to fully address hunger and thirst issues, indicating a need for more effective approaches [15].

1

Recent advancements, such as the 2024 European Society of Anaesthesiology and Intensive Care (ESAIC) guidelines, introduce the 6-4-3-1 rule. This rule permits clear fluids one hour before anesthesia and allows breastfeeding and formula feeding until 3 and 4 hours before induction, respectively []. Concepts like "Sip Til Send" promise to enhance patient experience, although further investigation is needed to validate their safety and efficacy [6]. Persistent efforts are required to maintain optimal preoperative fasting practices, including continuous improvement and follow-up [3]. Modern communication tools, such as text message reminders and infographics, have proven effective in improving adherence to fasting guidelines, with initiatives like the "THINK DRINK" campaign demonstrating the benefits of digital reminders over traditional methods like phone calls [1,9].

Additionally, preoperative carbohydrate-rich drinks consumed up to 4 hours before surgery have been shown to reduce postoperative insulin resistance, hunger, and nausea in adults.

Some research suggests chewing gum may help reduce hunger and increase satiety, though it may pose a risk if not removed preoperatively [21]. Evidence supports that limited preoperative fasting and carbohydrate loading can improve recovery outcomes and reduce postoperative complications. However, further research is needed to tailor these strategies for different age groups and specific conditions [20].

Educational interventions have significantly improved adherence to fasting guidelines, leading to a better understanding of fasting importance and associated risks like aspiration among parents [3]. Quality improvement programs and organizational strategies, such as providing clear, written information about fasting requirements, have enhanced compliance by improving preoperative logistics and reducing stress [9,16]. Despite these advances, there remains a critical need for enhanced education among healthcare professionals about current fasting protocols. Improved communication within surgical teams and the integration of updated standard operating procedures are essential to align practice with modern guidelines [7]. Continuous education and adopting new practices are necessary to address gaps in procedural knowledge.

Surgical nurses are integral to the preoperative process, including managing fasting periods and providing family education. They must stress the significance of following fasting guidelines to prevent complications and ensure a smoother recovery. Adequate preoperative preparation encompasses clinical, physical, and psychological elements, with appropriate fasting management essential for minimizing postoperative issues and supporting a swift recovery [16].

Addressing nutritional support and fasting compliance requires a collaborative, multidisciplinary approach involving anaesthesiology, surgery, gastroenterology, cardiology, and nutrition. Expert panels have reviewed best practices to enhance nutritional care for pediatric surgical patients, underscoring the importance of this approach [20]. Integrating educational initiatives, modern technology, and multidisciplinary collaboration is crucial for enhancing fasting compliance and patient safety. Continuous refinement and teamwork are essential to overcome existing challenges and achieve better outcomes.

Conclusion

Striking the right balance between minimizing aspiration risk and mitigating the adverse effects of prolonged fasting is crucial for pediatric patients. Modern guidelines, such as the 6-4-1 and 6-4-3-1 rules, reflect a more nuanced understanding of gastric emptying and patient comfort, yet challenges persist due to outdated practices, communication gaps, and logistical issues. Optimizing preoperative fasting requires adopting flexible protocols, enhancing family education, and improving healthcare team coordination. Continued research and a multidisciplinary approach are essential for refining these practices, ensuring effective and comfortable care, and ultimately leading to better patient outcomes and satisfaction.

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