



# Impact of pediatric surgery on anxiety in children and their families and coping strategies: a narrative review

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**Background and Objective:** During surgical procedures, children often experience significant anxiety, which affects their mental health and may have adverse effects on surgical outcomes and postoperative recovery. Additionally, pediatric emergency surgery, as a high-risk medical intervention, heightens anxiety in both children and their families. Therefore, understanding and addressing anxiety experienced by children and their families during surgery is particularly important. This study aimed to systematically review the relevant literature, analyze the primary factors influencing anxiety in children and their families during surgery, and discuss effective coping strategies to help healthcare providers reduce the anxiety levels of patients and their families, thereby promoting the safety of surgeries and postoperative recovery outcomes.

**Methods:** Recent literature was identified using the PubMed database with combinations of keywords “pediatric surgery”, “anxiety”, “children or families”, and “coping strategies”, focusing on studies published between 2010 and 2024. Eligible studies were identified through predefined inclusion and exclusion criteria. Data were synthesized using qualitative and quantitative methods to provide an overview of current evidence and identify research gaps.

**Key Content and Findings:** The review revealed a significant association between a child's age and preoperative anxiety levels. Key risk factors for preoperative anxiety included prior medical experiences, the family environment, and the nature of the surgical procedure. Family members' anxiety levels were positively correlated with those of the children. Notably, children who received preoperative education via virtual reality technology exhibited significantly lower anxiety scores compared to those who received traditional education methods. Additionally, interventions such as parental presence, music therapy, and psychological support were found to be effective in mitigating anxiety.

**Conclusions:** Managing anxiety during children's surgeries requires various approaches, and future research and clinical practice should complement each other to improve surgical experiences and mental health in children. By continuously optimizing the relevant strategies, we can create a safer and more supportive environment for children and their families during surgery.

**Keywords:** Pediatric surgery; anxiety; influencing factors; coping strategies; assessment tools

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## Introduction

Advancements in medical technology have improved the safety and effectiveness of pediatric surgery. However, anxiety experienced during surgery remains a significant concern. Anxiety affects the psychological state of children and imposes a significant psychological burden on their families. Anxiety in children before, during, and after surgery may affect their recovery process and adversely impact their future health (1). Previous studies have shown that preoperative anxiety levels in children are closely related to the speed and quality of their postoperative recovery. Children with higher anxiety levels often experience longer recovery times and greater pain (2-4). Various factors influence anxiety levels, including age, sex, medical history, type of surgery, and the family environment. For example, younger children often exhibit higher preoperative anxiety due to their limited understanding of the surgical process and fear of unfamiliar environments and medical procedures (5). Moreover, the anxiety levels of family members are closely related to children's postoperative recovery, as research indicates that parents' emotions and behaviors significantly influence children's anxiety levels. For instance, comforting parental behaviors can effectively reduce children's anxiety, whereas excessive worry may exacerbate their unease (6). Studies have found that negative emotions experienced by children in the hospital environment, such as fear of medical equipment and concerns about pain, can significantly increase preoperatively (7,8). Children's preoperative anxiety levels are influenced by factors such as type of surgery, age, sex, and previous surgical experience (1,9). For example, repeated surgeries often increase anxiety levels in families, particularly among mothers, who generally exhibit higher anxiety levels than fathers. Additionally, insufficient information about surgery can increase family anxiety; research indicates that understanding the surgical process is negatively correlated with anxiety levels. Providing adequate information and education can effectively reduce family anxiety and improve children's surgical experiences.

Psychological and educational interventions are commonly employed as coping strategies for anxiety among children and their families. Research has shown that implementing child-life preparation programs can effectively reduce children's preoperative anxiety. Activities such as role-playing, setting expectations, and teaching coping strategies help children to better understand the

surgical process, thereby alleviating anxiety (10). Digital educational videos have been shown to reduce parental anxiety, especially in cases of postoperative complications (5). Non-pharmacological interventions, such as guided imagery relaxation and distraction toys, show promise in reducing preoperative anxiety (11). Studies indicate that children undergoing anesthesia induction in preoperative areas exhibit significantly lower anxiety levels than those induced in the operating room (12-14). This highlights the importance of hospitals creating child-friendly environments during surgery to help reduce anxiety.

## The review

Anxiety is a complex issue that is influenced by multiple factors. Understanding the factors affecting anxiety in children and their families and implementing effective coping strategies can significantly improve the surgical experience and postoperative recovery outcomes.

## Aim(s)

This review aimed to investigate the key risk factors contributing to anxiety in pediatric patients and their families during surgery and to explore effective strategies for mitigating such anxiety. By analyzing and synthesizing current evidence, this review seeks to inform clinical practice and guide future research on enhancing the perioperative experience for children and their caregivers. We present this article in accordance with the Narrative Review reporting checklist (available at <https://tp.amegroups.com/article/view/10.21037/tp-2025-10/rc>).

## Methods

This article is a literature review on the impact of pediatric surgical procedures on anxiety in children and their families, as well as their coping strategies. *Table 1* summarizes our search strategy, which examined previously published journal articles that studied, analyzed, and discussed the effects of pediatric surgery on anxiety in children and their families. We reviewed the most recent literature from the past 15 years [2010–2024]. We conducted our search using the PubMed database with the keywords “pediatric surgery”, “anxiety”, “children or families”, and “coping strategies”.

**Table 1** The search strategy summary

Items	Specification
Date of search	November 15, 2024, January 3, 2025
Database searched	PubMed
Search terms used	“pediatric surgery”, “anxiety”, “children or families”, and “coping strategies”
Timeframe	From January 1, 2010 through December 31, 2024
Inclusion and exclusion criteria	<p>Inclusion criteria: (I) study types were randomized controlled trials (RCTs), cohort studies, or case-control studies that specifically assess the impact of pediatric surgery on anxiety levels in children and their families; (II) participants were children aged 0–18 years who underwent any surgical procedure, regardless of gender, and their families; (III) interventions included any form of pediatric surgical procedures, with or without additional psychological support or coping strategies; (IV) outcomes measured included anxiety levels (using validated scales such as the State-Trait Anxiety Inventory for Children), family coping strategies, and any related psychological outcomes; (V) studies had to report pre- and post-surgery anxiety levels or coping strategies to allow for comparison; and (VI) studies were published in English or Chinese</p> <p>Exclusion criteria: (I) non-original research, such as review articles, conference abstracts, expert opinions, and summaries; (II) studies that do not focus on pediatric surgery or did not include children as participants; (III) studies with unclear research designs or incomplete data from which key information could not be extracted; (IV) studies that did not report relevant anxiety or coping strategy outcomes; (V) studies involving patients with significant comorbid psychiatric disorders that could confound the results; and (VI) studies that did not provide full-text access or those with insufficient methodological quality</p>
Selection process	The search outcomes were meticulously scrutinized by three distinct authors (X.M., Z.Z., and Y.B.), adhering strictly to the predefined inclusion and exclusion criteria. In instances in which discrepancies arose, a fourth reviewer (H.Z.) was involved to provide an impartial decision. All authors approved the final list of references

## Results and findings

### *Definition and classification of anxiety*

#### **Psychological definition of anxiety**

Anxiety is a common psychological state that is typically characterized by worry and fear regarding future uncertainties or potential threats. According to psychological definitions, anxiety is not merely an emotional response; it also involves multiple physiological, cognitive, and behavioral reactions. Anxiety can be viewed as an adaptive response that helps individuals cope with dangers. However, when anxiety levels exceed adaptive limits, it can result in dysfunction and mental health issues.

### *Influencing factors of anxiety in children*

#### **Impact of age and developmental stage**

Surgical anxiety in children is closely related to their age and developmental stage. Research indicates that younger children often exhibit higher levels of anxiety when faced with surgery. This is primarily because their cognitive abilities are not fully developed, making it difficult for them

to understand the necessity and process of surgery, thereby increasing their fear of the unknown (15). For example, studies have found that children under 6 years of age have significantly higher preoperative anxiety scores than older children (16). Additionally, children’s emotional regulation abilities and coping strategies improve with age, allowing older children to better understand and cope with surgery-related stress (17). Therefore, it is imperative to develop personalized anxiety management strategies for children in different age groups.

#### **Fear and unease regarding surgery**

Anxiety and fear are common psychological reactions experienced by children before surgery. Research has shown that children’s fear of surgery primarily stems from concerns about the unknown, fear of pain, and uncertainty about surgical outcomes (18). Preoperative education and psychological preparation can significantly reduce anxiety. For instance, using virtual reality (VR) technology to allow children to experience the surgical environment before the procedure has been shown to effectively alleviate their fear (19). Furthermore, parents’ attitudes and behaviors can

also influence their anxiety levels. We found that parental comfort and a sense of control provided to children can significantly reduce preoperative anxiety (6,20-22). Therefore, psychological interventions for children, such as preoperative counseling and education, can effectively alleviate fear and ease surgery anxiety.

### **Impact of previous medical experiences**

Children's past medical experiences have a profound impact on their subsequent medical anxiety. Research has shown that children who have experienced painful or unpleasant medical encounters often exhibit higher anxiety levels in subsequent medical processes (23). For example, children who have undergone invasive treatment or hospitalization may develop strong fears regarding future medical procedures, leading to increased anxiety and discomfort when facing new medical situations (24). Therefore, healthcare providers should fully consider children's past medical experiences when treating pediatric patients and implement appropriate psychological support measures to alleviate their anxiety.

### *Influencing factors of family anxiety*

#### **Worries about surgical outcomes**

Family concerns about surgical outcomes are one of the main factors that contribute to anxiety. Research has indicated that the nature, complexity, and potential risks of surgery can exacerbate family anxiety. Families often have significant concerns about the patient's postoperative recovery, complications, and survival rates, especially when facing major surgeries. This anxiety arises from concerns about the patient's health, recognition of their roles, and sense of responsibility. Families often repeatedly contemplate the necessity and effectiveness of surgery before it occurs, which leads to heightened anxiety. Therefore, providing families with detailed information about the surgery and expected outcomes before the procedure can help alleviate their anxiety (25).

#### **Lack of information and communication barriers**

Lack of information and barriers to communication are significant factors that influence family anxiety. During the medical process, families often feel a sense of information asymmetry, especially when healthcare providers fail to clearly and promptly communicate the patient's condition and treatment plan, which can significantly increase family anxiety. Research shows that families' desire for medical

information is negatively correlated with their anxiety levels: the more information they have, the lower their anxiety. Additionally, good communication between healthcare providers and families can enhance families' understanding of and trust in the treatment process, thereby reducing anxiety levels. Therefore, medical institutions should prioritize communication with families to ensure that they receive adequate information and support during treatment (26).

#### **Family roles and sense of responsibility**

Family roles and a sense of responsibility are also important factors that influence family anxiety. Many family members feel a heavy sense of responsibility when facing a patient's illness, especially when viewed as primary caregivers. This sense of responsibility may lead to excessive worry and anxiety regarding the patient's health. Research indicates that family members often feel overwhelmed when caring for patients, which can affect their mental health. Therefore, healthcare teams should pay attention to the psychological state of family members and provide necessary support and guidance to help them cope better with the pressures of caregiving (27).

#### **Social support and economic pressure**

Thus, the impact of social support and financial stress on family anxiety cannot be overlooked. Research has found that families lacking social support are more likely to feel anxious, whereas good social support can significantly reduce anxiety levels. Additionally, economic pressure is also a significant source of anxiety for families, especially during periods when patients require long-term treatment or recovery after surgery, as financial burdens may exacerbate psychological stress on families. Therefore, medical institutions should consider providing financial support and psychological counseling to help families alleviate the anxiety caused by economic pressure (28).

#### *Common assessment tools and methods*

Several methods exist for assessing anxiety, with commonly used scales including the State-Trait Anxiety Inventory (STAI), Hospital Anxiety and Depression Scale (HADS), and Visual Analog Scale (VAS). STAI can be used to assess an individual's anxiety state at a specific moment and long-term anxiety traits, demonstrating good reliability and validity (29). HADS focuses on the anxiety and depression states of patients in hospital settings, making it suitable for clinical screening (30). Additionally, the VAS is often used

for quick assessments of patients' anxiety levels, particularly in clinical scenarios that require rapid feedback (31). In recent years, technological advancements have led to the gradual introduction of ecological momentary assessments in anxiety assessments, enabling long-term monitoring through smartphone applications to capture fluctuations in individuals' anxiety throughout daily life, demonstrating high reliability and validity (32). These scales and methods have shown unique application value in various clinical and research contexts. The combination of subjective and objective assessments is crucial for anxiety evaluation. Subjective assessments typically rely on self-reported questionnaires and scales from patients that can reflect individuals' emotional experiences and psychological states. However, subjective assessments may be influenced by personal emotions and cognitive biases, which have certain limitations (33). In contrast, objective assessments collect data through physiological indicators (such as heart rate and skin conductance response) or behavioral observations, providing more objective indicators of anxiety levels (34). Therefore, combining subjective and objective assessments can improve the accuracy of anxiety assessments and provide a scientific basis for developing personalized intervention plans, helping clinicians gain a more comprehensive understanding of patients' psychological states and needs (35).

### *Coping strategies to alleviate anxiety*

#### **Communication and information provision by the medical team**

The medical team plays a crucial role in addressing the anxiety of patients and their families. Research has shown that effective communication and information exchange by the medical team can significantly reduce anxiety levels in both patients and their families. For example, providing detailed information about the surgical process, expected outcomes, and potential complications helps families better understand the treatment process, thereby alleviating unnecessary worries and fears (36). In one study, structured audiovisual information was used instead of traditional verbal information, and the results showed that families receiving structured information had significantly lower preoperative anxiety levels than those receiving only verbal information (36). Additionally, when communicating, the medical team should consider the educational background and cultural differences of families to ensure the effective transmission and comprehension of information (37). Therefore, medical teams should prioritize training

in communication skills to ensure clear and effective information exchange, thereby reducing anxiety in both patients and their families during treatment.

#### **Psychological interventions and support**

Psychological intervention and support are important strategies for coping with anxiety. Research indicates that psychological treatments such as cognitive-behavioral therapy and exposure therapy significantly reduce anxiety symptoms in children and adolescents (38). These methods help patients identify and challenge negative thought patterns, thereby improving their emotional state. Additionally, psychological interventions targeted at specific groups, such as providing play therapy or art therapy for children, have been shown to effectively reduce anxiety (24). In medical settings, providing psychological support and interventions not only helps patients cope with preoperative anxiety but also improves their overall medical experience (39). Therefore, medical institutions should prioritize mental health services to ensure that patients receive psychological support during treatment.

#### **Environmental optimization and accompaniment strategies**

Optimizing the environment and implementing accompanying strategies are also effective means of alleviating anxiety. Research has shown that a comfortable environment can significantly reduce patients' anxiety levels. For example, creating a cozy waiting area outside the operating room with comfortable seating and entertainment facilities can help patients and their families relieve tension (40). Additionally, having loved ones nearby can help ease patients' anxiety, especially before children's surgeries, where parental presence provides emotional support and reduces children's fear (6).

### *Recent research findings and theoretical framework*

#### **Clinical trial results of anxiety interventions**

In recent years, clinical trial results on anxiety interventions have shown that psychological intervention methods are increasingly being recognized for their effectiveness in alleviating anxiety symptoms. For example, a randomized controlled trial involving children found that guided imagery relaxation techniques significantly reduced preoperative anxiety and postoperative pain (14). Additionally, another study indicated that in children with drug-resistant epilepsy undergoing surgery, anxiety and depression symptoms

improved over 2 years, and this improvement was unrelated to the control of seizures, suggesting that surgery may have a positive impact on mental health (41). These findings provide new clinical evidence for anxiety management, emphasizing the importance of psychological interventions in surgical and medical procedures.

### **Application of emerging technologies in anxiety management**

Emerging technologies, particularly VR, have great potential for managing anxiety. One study found that VR effectively reduced children's anxiety levels during dental treatment, providing a non-pharmacological intervention method (42). Another study involving adults showed that VR significantly reduced pain during botulinum toxin injection. Although its impact on anxiety was not significant, patient satisfaction with the VR experience was high, indicating its potential for clinical applications (43). Furthermore, VR has been used to help reduce anxiety in children before surgery. Research has shown that VR interventions effectively distract attention, thereby alleviating preoperative anxiety (44). These findings suggest that VR, as an innovative psychological intervention tool, offers new solutions for anxiety management and warrants further promotion and application in clinical practice.

### **Development of personalized anxiety management strategies**

The development of personalized anxiety management strategies will be a key focus of future research. In recent years, increasing attention has been paid to the role of individual differences in the manifestation of anxiety symptoms and coping mechanisms. Research indicates a significant association between personality traits, such as neuroticism and anxiety levels, which may influence postoperative outcomes through their impact on anxiety levels (45). Therefore, future research should focus on developing personalized anxiety management plans based on individual personalities, living environments, and psychological states. For example, using psychological assessment tools to evaluate patients' anxiety levels and combining biomarkers with psychological characteristics to develop personalized intervention measures will enhance the treatment specificity and effectiveness. Additionally, as digital health technologies develop, personalized anxiety management strategies can be more easily implemented and monitored through mobile applications and online platforms, thereby enhancing patient compliance and

satisfaction (46).

This study explored the complex psychological issue of anxiety experienced by children and their families during pediatric surgery. A comprehensive analysis of existing research shows that anxiety is influenced not only by the surgery itself but also by various interacting factors, such as the child's age, health status, family support, and the communication abilities of healthcare providers. There are multiple intervention strategies proposed for anxiety management, such as effective communication, psychological support, and family involvement, which can alleviate anxiety and improve the surgical experience. However, the viewpoints and findings across different studies are not entirely consistent, reflecting the multidimensional nature and individual variability of anxiety. Some studies emphasize the importance of psychological interventions, suggesting that professional counseling and support can significantly improve the emotional states of children and their families, whereas others highlight the indispensable role of family involvement and support. Therefore, in practical clinical applications, it is necessary to consider the results of various studies to identify the most suitable intervention measures for specific patient populations. Future research should explore personalized intervention strategies to better address the needs of children and their families. Personalized interventions can be adjusted based on the patient's specific situations, considering factors such as family background, psychological state, and cultural differences to improve the effectiveness of interventions. Furthermore, additional research should focus on strengthening the long-term evaluation of intervention effects to gain a more comprehensive understanding of anxiety trends and their impacts on surgical outcomes.

### **Discussion**

The anxiety experienced by children undergoing surgical procedures is a significant concern in pediatric healthcare, warranting focused attention due to its potential impact on both patients and their families. Surgical anxiety in children can lead to adverse outcomes, such as prolonged recovery times and increased postoperative complications, thus necessitating effective management strategies. Research has shown that various factors, including the child's age, previous medical experiences, and familial dynamics, can contribute to the levels of anxiety experienced before surgery. Furthermore, the psychological burden extends beyond the child, often affecting parents and siblings,

thereby influencing the overall family well-being and functionality (47,48).

This study aims to synthesize existing literature to explore the multifactorial nature of surgical anxiety in pediatric patients and their families. By identifying key risk factors and evaluating intervention strategies, the research provides valuable insights that can inform clinical practices and enhance preoperative care. Key findings indicate that age and prior medical experiences significantly affect anxiety levels, emphasizing the need for tailored interventions that consider these variables. Moreover, the effectiveness of preparatory programs, such as child life interventions, underscores the importance of preoperative education in alleviating anxiety and promoting better surgical outcomes (47,49,50).

The current study addresses a significant gap in the understanding of anxiety experienced by children undergoing surgery, particularly in the context of its multifaceted risk factors and the resulting implications for treatment. Prior research has indicated that preoperative anxiety is common among pediatric surgical patients, but our findings extend this understanding by highlighting the specific impact of age, prior medical experiences, and familial support systems on anxiety levels. For instance, younger children, particularly those under six, demonstrated markedly higher anxiety scores compared to their older counterparts, aligning with previous studies that suggest developmental differences significantly influence anxiety symptoms (51,52). Furthermore, our identification of parental anxiety as a predictor of children's anxiety reinforces the need for integrated approaches that consider the familial context, as seen in other studies exploring the interplay between parental and child anxiety in surgical settings (53).

The clinical implications of these findings are profound, suggesting that tailored interventions that address both child and parental anxiety could enhance perioperative experiences. The results indicate that engaging parents in preoperative education and preparation, such as through creative activities like coloring, may provide a dual benefit by reducing anxiety levels in both children and parents (47). This approach aligns with evidence supporting the efficacy of psychological interventions in pediatric populations (48) and offers a practical framework for healthcare providers to implement in surgical settings. By adopting strategies that incorporate family dynamics and children's developmental stages, healthcare professionals can create a more supportive

environment that potentially mitigates anxiety and enhances overall surgical outcomes.

## Conclusions

Managing anxiety during children's surgeries requires various approaches, and future research and clinical practices should complement each other to improve surgical experiences and mental health in children. By continuously optimizing the relevant strategies, we can create a safer and more supportive environment for children and their families during surgery.

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