

Review Article

Strategies for Managing Preoperative Anxiety in Children: A Comprehensive Approach

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ABSTRACT

Introduction: Preoperative anxiety is prevalent among pediatric patients and may adversely affect anesthetic induction, postoperative recovery, and long-term psychological outcomes. It arises from developmental vulnerability, lack of understanding, and exposure to unfamiliar environments. **Method:** This narrative review synthesizes evidence from studies retrieved via PubMed, ScienceDirect, and EBSCO, using keywords related to preoperative anxiety, pediatric patients, and management strategies. The review explores both risk factors and intervention modalities. **Results:** The database search using predefined keywords yielded a total of 193 articles. After screening and eligibility assessment, 22 articles met the inclusion criteria and were included in this literature review. **Conclusions:** A comprehensive, individualized approach combining both pharmacological and non-pharmacological strategies is essential to effectively manage preoperative anxiety in children. Early identification of risk factors and tailored interventions can significantly enhance perioperative experiences and outcomes.

1. INTRODUCTION

Pediatric patients undergoing medical procedures often experience significant anxiety due to their limited understanding and control over the environment and situations they encounter during hospital treatment. Surgery and anesthesia represent particularly stressful and anxiety-inducing phases for this population. This anxiety typically arises from feelings of worry, nervousness, or apprehension about uncertain outcomes.¹ Previous studies have shown that between 50% -75% of children develop preoperative anxiety.²

Children experiencing anxiety may show distress behaviors such as fear, crying, clinging to caregivers, or attempting to escape.³ Increased blood pressure, heart rate and sensitivity can occur due to inadequate preoperative anxiety management, which can increase the intensity of postoperative pain, greater use of analgesia, agitation and delirium after anesthesia and also surgical outcomes.^{4,5} Especially in pediatric patients, this preoperative anxiety must be managed more comprehensively because several factors include physiological autonomic nerve activity in children is increased compared to adults so it will take longer at the time of induction, the duration of anesthesia and the time of emergence. Preoperative anxiety can also lead to the occurrence of unwanted injuries due to the child's fear of the medical environment. In the long term, this anxiety can cause negative behavior such as delirium, nightmares, parental anxiety, sleep disturbances, bedwetting, tantrums and others that can last up to one year after discharge.⁵

It is essential for the medical team to identify and manage risk factors that can elevate preoperative anxiety as part of an effective anxiety management strategy. Currently, both non-pharmacological and pharmacological interventions have been developed to assist pediatric patients in reducing their anxiety levels prior to surgery.^{6,7} This review serves as a comprehensive guide for anesthesiologists and medical teams responsible for the care of pediatric patients undergoing medical procedures or surgeries to manage preoperative anxiety.

2. METHODS

The method used in this literature review was a narrative approach based on various references focusing on the topic of preoperative anxiety in children. The literature search was conducted through four reputable online databases: PubMed, EBSCO, ScienceDirect, and Google Scholar. The keywords used in the search included "Preoperative anxiety," "Pediatric," "Child," "Strategies," "Management," and "Techniques," which were combined using Boolean operators.

The inclusion criteria were limited to English-language, peer-reviewed studies involving pediatric patients undergoing surgical procedures, with research designs such as randomized controlled trials (RCTs), experimental studies, case-control studies, observational studies, descriptive studies, literature reviews, and systematic reviews, published between 2013 and 2024. Studies that were not available in full text or that did not meet the relevance criteria were excluded. Following PRISMA guidelines, the review process was carried out in a systematic and transparent manner. Articles that met inclusion criteria were critically appraised for methodological soundness and clinical value. The synthesized findings supported evidence-based strategies to address preoperative anxiety in children undergoing surgery.

3. RESULTS

A total of 193 articles were retrieved from four major databases: PubMed (149), EBSCO (24), ScienceDirect (5), and Google Scholar (15). After removing duplicate records, a total of 72 unique articles remained. These were screened by title and abstract, resulting in the exclusion of 31 articles due to irrelevance or insufficient focus on pediatric preoperative anxiety. The remaining 41 articles underwent full-text review. Of these, 19 articles were excluded because they did not meet the eligibility criteria—either due to unrelated outcomes, inappropriate study populations, non-research formats (e.g., editorials or letters), or inadequate methodological clarity. As a result, 22 studies met the inclusion criteria and were included in the final review. These studies covered a range of topics related to risk factors, as well as both pharmacological and non-pharmacological strategies for managing preoperative anxiety in children. The literature selection process is illustrated in Figure 1 (PRISMA flow diagram).

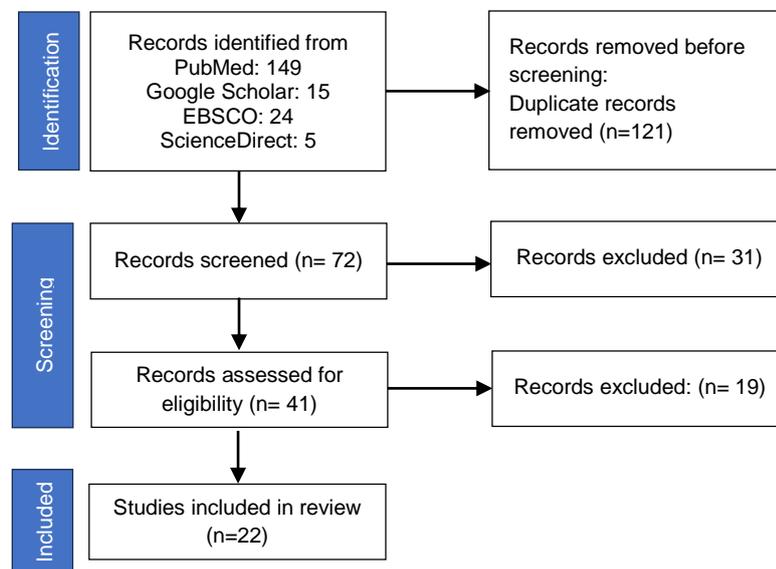


Fig 1. PRISMA flow diagram

4. DISCUSSION

4.1 PSYCHOLOGICAL DEVELOPMENT IN CHILDREN

Understanding the child's stage of psychosocial development is crucial to directing interventions at the right time. Erikson's psychosocial developmental phases are among the various theories of child development stages that are most readily applicable to the perioperative context. According to Erikson's theory of psychosocial development, children go through five developmental phases.⁸

The first stage is from birth to one years old. In this stage children are in the stage of 'trust vs mistrust'. In order to fulfil the needs of the infant, psychosocial child life interventions would emphasize regular care and parental participation. This is because separation from carers and novel routines, locations, and people can induce stress. In order to establish trust and familiarity in the preoperative setting, it would still be crucial to talk to the baby and encourage in-person contacts with professionals, even if the parents would be the main emphasis. There would be toys with tactile, auditory, or visual stimuli available.⁸

The second stage is 1-3 years old when the child is in the autonomy vs doubt stage of development. Children may experience difficulties with separation anxiety at this age, as well as fewer opportunities for independence and control. Psychosocial therapies usually concentrate on providing opportunities for play and exploration of the preoperative materials and environment to help patients feel more normal. Instruction would be provided step-by-step and have a concrete, as opposed to abstract, focus.⁸

The third stage is from 4-5 years old when the child is in the initiative vs. guilt stage. Children may struggle at this period to feel independent and in charge of their lives. They frequently think magically and are egotistical, which can cause miscommunication and anxiety. In order to dispel any misunderstandings the child may have about the surgical procedure, child life interventions would try to give the child more control over the situation, explain things in an age-appropriate manner, and gauge their level of understanding. Children should be encouraged to communicate their emotions and concerns and, if at all feasible, be given a role in any procedures they may have. At this point, children can also practice coping mechanisms like blowing bubbles with the induction mask and practice breathing through it while wearing it on their faces.⁸

The fourth stage is from 6-12 years old when the child is in the industry vs inferiority stage of development. Children may find it difficult to break away from their regular routines related to school, family, and classmates at this age. They might think in concrete, literal terms, which could lead to misunderstandings and lower self-esteem. It would be crucial at this point to explain to the child the purpose of certain actions taken in the preoperative environment. To clear up any misunderstandings, they ought to be given the chance to voice their concerns and ask questions.⁸

Finally, the child is in the stage of identity vs role confusion, which lasts from 13 to 17 years old. Children may experience difficulties in this period with respect to privacy, peers, independent play, making decisions, and other people's viewpoints. It would be crucial to give rational and truthful justifications for the necessity of the surgery, list the bodily areas it will affect, and discuss any potential long-term effects. Adolescents at this period may fear death or disability, thus addressing and elucidating these anxieties is essential to lowering anxiety.⁸

4.2 RISK FACTOR OF PREOPERATIVE ANXIETY

The child experiences unfamiliar surroundings and new individuals in charge in the operating theatre. As a result of their anxiety of experiencing unpleasant physical stimuli repeatedly, an exaggerated sense of helplessness takes hold of their thoughts. Fear and worry overshadow the healthcare personnel' attempts to soothe the child when parents are absent, anxious, or have less control over the situation. Preoperative anxiety in children can be caused by a number of factors, according to research as follows: (1) fear of harm or injury to their body, such as pain, mutilation, or death; (2) separation from parents and there is no trusted adults, particularly for preschool-aged; (3) uncertainty about "acceptable" and normative behavior in a hospital setting; (4) loss of control, autonomy, and competence; (5) exposure to and touching of "private parts" by strangers; (7) and medical terminology.^{9,10}

In the preoperative period, there are also certain periods of time when the anxiety reaches its peak. When these situations, or "stress points," are not properly attended to, children attempt to give caretakers as much resistance as possible. The separation from

parents and/or other responsible adults, going into the operating room, putting the child on the operating table, witnessing the syringes, connecting the monitors, inserting the intravenous cannula, wearing a mask, etc. are some of the stressors.¹⁰

The level of preoperative anxiety depends on several factors, including child-related, parent-related, and environment-related variables (Table 1). Recognizing and addressing these risk factors is a critical element in the comprehensive management of preoperative anxiety. Early identification of at-risk pediatric patients—such as those with a history of negative medical experiences, low social adaptability, or those with anxious parents—enables the implementation of individualized, evidence-based interventions. These may include parental education and support, behavioral preparation strategies tailored to developmental stage, and environmental modifications within the perioperative setting. Integrating such targeted approaches into routine preoperative care may significantly reduce anxiety levels and improve both anesthetic compliance and postoperative recovery.

Table 1. Factors determining increased anxiety in preoperative period.^{2,5,9}

Category	Risk Factor	Description
Child Factors	Younger age (1–6 years)	Highest risk; especially ages 1–5 due to developmental limitations
	Shy/inhibited temperament	Low sociability and introversion increase anxiety
	High IQ + poor social skills	More awareness, but less coping ability
	Previous negative medical/surgical experience	Painful or traumatic memories increase future anxiety
	Not attending preschool	Less exposure to structured social environments
	No siblings	Fewer modeled coping strategies
	Low body weight	Indicator of poor nutrition or frailty
	Psychological/developmental disorders	Autism, ADHD, anxiety disorders, etc. increase vulnerability

	Language barriers	Miscommunication and confusion heighten fear
Parental Factors	Parental anxiety	Strong correlation; children mirror parental stress
	Higher maternal vs. paternal anxiety	Mothers more strongly influence younger children
	Separated or divorced parents	Family instability reduces emotional support
	Poor parent–child relationship	Weak attachment leads to less coping resilience
	Parents lacking religious/spiritual support	Linked to increased stress in both parents and children
	Low education or socioeconomic status	May reduce ability to support or reassure child
Environmental Factors	Outpatient setting	Less preparation time, rushed and unfamiliar environment
	Long pre-surgery waiting time	Increases anticipation and distress (>10 minutes noted as impactful)
	Too many personnel during induction	Overwhelming stimuli, intimidating for children
	Bright lights/noise/alarms in OR	Sensory overstimulation
	Untrained or unsympathetic staff	Poor emotional handling increases fear

IV induction without numbing	Painful experience escalates anxiety
Unfamiliar or cold waiting environment	Familiar toys or calming decor can mitigate stress

4.3 MANAGEMENT

4.3.1 NON-PHARMACOLOGICAL MANAGEMENT

Various factors—including those related to the child, parents, and healthcare providers, as well as the nature of the interventions and treatments delivered—can significantly influence the level of perioperative anxiety and its associated outcomes. Patient-centered management of perioperative anxiety, which targets the most relevant predictors and outcomes, may involve pharmacological, non-pharmacological, or combined approaches. In general, non-pharmacological modalities encompass educational strategies, behavioral techniques, parental presence during induction of anesthesia (PPIA), and a range of complementary and alternative medicine (CAM) methods. Each category includes a variety of evidence-based interventions proven to effectively reduce anxiety. These approaches are typically cost-effective, minimally invasive, and carry a low risk of adverse effects, supporting their broad and sustainable implementation in clinical practice. Moreover, recent advances in the integration of internet-based interventions and mobile health (mHealth) technologies—such as tablets, smartphones, and other web-enabled devices—have demonstrated early promise. These digital tools are well-received by parents and have shown potential in delivering individually tailored therapeutic components in a flexible and accessible manner.¹¹

4.3.1.1 EDUCATIONAL APPROACHES

Preoperative education can fill in knowledge gaps about procedures and outcomes for patients and their families, which helps to better prepare patients and their families for surgery and lower anxiety levels. Children who have reasonable expectations for the perioperative course are better able to cope with and prepare for both inpatient and outpatient surgeries. Educational preparation programs typically involve a tour of the operating room and PACU, an orientation to medical equipment and its functions, and descriptions or visual depictions of perioperative procedures. These programs are still in use for both inpatient and outpatient surgery.^{11–13}

Healthcare professionals should explain the surgical procedure, include a list of participants, and discuss any sensory issues. The amount that is retained may also depend on when preparatory information is given. Although the best time to provide it is unknown, preliminary research indicates that children older than six should receive it no later than five days in advance, and younger children should receive it no later than one week.¹¹

4.3.1.2 BEHAVIOURAL APPROACHES

Targeting behavioral factors is the focus of several methods designed to lower perioperative anxiety. Among these tactics, cognitive behavioral therapy

(CBT)-based solutions are among the most popular. Comprehensive preparation activities might entail modelling and improving behavioral coping abilities in addition to just delivering facts. Rather of depending solely on informational or pharmaceutical approaches to reduce procedure-related anxiety in children, cognitive behavioral therapies explicitly assist kids acquire and apply these abilities. Components of CBT can be customized to meet the unique needs of kids having surgery, and they can be used in conjunction with other anxiety-reduction strategies.^{13,14}

Children getting surgery can benefit from using effective cognitive coping strategies like distraction. Through the use of this skill, children are encouraged to focus on more peaceful and enjoyable activities or ideas rather than worrying or frightening aspects of the perioperative procedure. Similar to other cognitive behavioral therapy methods, children can learn and practice purposeful active distraction prior to their procedure. It is often advantageous for guardians or parents to act as coaches in order to promote the use of this skill throughout the perioperative period.^{11,13,15}

In the context of cognitive behavioral therapy, coping strategies that encourage relaxation are also successful in reducing perioperative anxiety. Children as young as 4 years old can employ progressive muscle relaxation and diaphragmatic breathing, and school-age children can use guided imagery activities to help them cope with procedure-related distress. Diaphragmatic breathing is a behavioral therapy that uses the diaphragm to facilitate deep, controlled inhalation and exhalation. It is also known as aware breathing and deep breathing in the literature. Providers can train children in breathing, muscular relaxation, and imagery techniques in person, via video, or through audio recording. These are repetitive activities that don't need further materials once kids have mastered and practiced the abilities enough. These methods can also be taught to parents so they can mentor their kids through age-appropriate activities.^{11,15}

4.3.1.3 PARENTAL PRESENCE AT INDUCTION OF ANAESTHESIA (PPIA)

There is an intuitive expectation that the involvement of one or both parents in preparation for surgical procedures, including induction of anaesthesia, would reduce a child's anxiety. In fact, early research on PPIA found connections between the condition and children's decreased anxiety, especially separation anxiety, and enhanced collaboration. In the US, parental presence is not generally or arbitrarily advised; rather, it is permitted and encouraged only at the anesthesiologist's discretion. It is crucial to bear this in mind while analyzing recent empirical studies that doesn't seem to strongly support the usage of PPIA above other methods. Research indicates that while children with anxious parents may actually experience increased anxiety, anxious children with calm parents may benefit from PPIA.^{1,11,16,17}

4.3.1.4 COMPLEMENTARY AND ALTERNATIVE MEDICINE (CAM) APPROACHES

Children have been the subjects of studies on complementary and alternative medical techniques such as music therapy, hypnosis, patient acupuncture, and parental acupuncture. Because interactive music therapy encourages children to communicate their emotions, it differs from passive music appreciation or listening.¹¹

During the perioperative phase, children can effectively communicate and overcome their anxieties through the use of music. It has been observed that hypnosis produced by healthcare professionals is very useful when inducing anesthesia in children. Additionally, by sustaining a state of inwardly focused attention, it may help youngsters form more favorable memories. Originally an important part of traditional Chinese medicine, acupuncture applies specialist needles to specific places on the body to release tension. In particular, research has been done on auricular acupuncture at three locations that are known to lower state anxiety.¹¹

Given the wide array of non-pharmacological options available, it is important to present these interventions in a structured framework that reflects their primary mechanisms and modes of application. Table 2 summarizes the major categories of non-pharmacologic strategies for managing preoperative anxiety in children—namely, educational strategies, behavioral techniques, parental presence during anesthesia induction (PPIA), and complementary and alternative medicine (CAM). These modalities provide clinicians with a flexible, evidence-based toolkit that can be adapted to individual patient profiles, developmental needs, and clinical settings.

Table 2. Strategies of Non-Pharmacologic Management for Pediatric Surgical Anxiety

Modality	Intervention Type	Description / Examples
Educational Strategies	Preoperative preparation programs	Age-appropriate information about surgery, what to expect, and the roles of healthcare providers
	Audiovisual education	Peer-modeling videos, animated content, interactive storytelling
	Hospital tours / equipment orientation	In-person or virtual orientation to the operating room and recovery area
	mHealth / Web-based apps	Tailored mobile applications or web platforms offering education and coping skill training
Behavioral Techniques	Cognitive Behavioral Therapy (CBT)	Structured coping skills training: relaxation, positive self-talk, problem-solving

	Distraction techniques	Play dough, video games, mask-blowing games, drawing, storytelling
	Guided imagery	Mental visualization of calming scenes, used during induction or waiting periods
	Relaxation exercises	Diaphragmatic breathing, progressive muscle relaxation
	Peer modeling	Videos showing other children undergoing surgery with positive coping
	Therapeutic play	Medical role-play, puppet-based storytelling, drama activities
Parental Presence (PPIA)	Presence during induction	Parent stays with the child during induction of anesthesia
	Parental coaching in coping	Parents are trained to support children using CBT-based or relaxation strategies
	Parental preparation programs	Educational and emotional preparation sessions involving both child and parent
Complementary & Alternative Medicine (CAM)	Music therapy	Passive listening or interactive expression through music
	Hypnosis	Therapeutic focus and suggestion techniques used to reduce anxiety and improve cooperation
	Acupuncture	Auricular acupuncture used primarily to reduce parental anxiety
	Acupressure	Non-invasive stimulation of calming points such as Extra-1
	Aromatherapy	Use of essential oils like lavender or citrus to induce relaxation

4.3.1.5 USING TECHNOLOGY

Websites, mobile applications based on the web, and virtual reality (VR) experiences can all be used in audiovisual programs in one way or another. Children's audiovisual treatments are based on media and usually include a video component for preoperative educational preparation.¹⁸

When a kid experiences anxiety associated to a procedure, audiovisual interventions can also include an auditory component, like an interactive video game or an audio recording for guided imagery, to help the child relax or divert their attention. When compared to children who receive merely standard care—which, depending on the medical facility, may involve PPIA, sedative premedication, or a mix of the two—children who receive an AV intervention typically see considerable reductions in preoperative anxiety.^{18,19}

Since VR exposure research has shown that VR is useful in treating certain phobias, more recent studies have started to look at VR's potential to help children with perioperative anxiety.^{19,20} Virtual reality (VR) technology not only diverts kids from stressful stimuli but may also expose them, in advance of a scheduled surgery, to pertinent parts of the medical setting, such as the operating room, through virtual tours. Finally, coping skill training and preoperative preparation websites and other web-based interventions work well to lower children's perioperative anxiety.¹⁸⁻²⁰

4.3.2 PHARMACOLOGICAL MANAGEMENT

A thorough, patient-specific risk/benefit analysis must be performed for each patient, and every pediatric pre-anesthetic examination should include the necessity of premedication and the identification of any potential contraindications to it. Drugs commonly used include benzodiazepines, α 2-adrenoceptor agonists, N-methyl-D-aspartate (NMDA) receptor antagonists, and opioids (Table 3). The formulation, pharmacological profile, and contraindications of the medication, as well as the child's level of compliance and any history of agitation following anesthesia, all play a role in the selection of the medication.⁷

Table 3. Pharmacological methods – sedative premedication.^{7,21}

Drug	Route	Dose	Remarks
Benzodiazepines			
Midazolam	PO	0.5-0.75 mg/kg, max. 20 mg	Paradoxical agitation in some patients
	IN	0.3 mg/kg	Causes stinging
Lorazepam	IV	0.05-0.1 mg/kg	
Temazepam	PR	0.05-0.1 mg/kg	Preferred in older children
	PO	0.025-0.05 mg/kg, max. 4 mg	
	PO	0.3-0.5 mg/kg, max.20mg	
Alpha-2 agonists			
Clonidine	PO	3-4 mcg/kg	Added benefits of reduced need for rescue analgesia, reduced emergence

			agitation, PONV, and shivering Caution in patients with grade 2 or 3 heart block, hypertension, cardiovascular disease, instability, on digoxin
	IN	2-4 mcg/kg	
Dexmedetomidine	PR	2.5-5 mcg/kg	
	IN	1-2 mcg/kg	
NMDA antagonist			
Ketamine	PO	5-8 mg/kg	Hallucinations and increased secretions can occur, emergence delirium, and PONV; IM ketamine is reserved for older uncooperative children with developmental problems
	IM	4-6 mg/kg	
	IV	0.5-1 mg/kg	

Benzodiazepines are the most widely used due to their reliable anxiolytic, sedative, and amnesic effects. Midazolam, in particular, is favored for its rapid onset, short duration of action, and multiple routes of administration, including oral, intranasal, and sublingual. Oral midazolam at doses of 0.25–0.5 mg/kg is commonly used in pediatric patients, although the potential for paradoxical reactions, residual sedation, and respiratory depression warrants cautious dosing and monitoring. Diazepam and lorazepam may be used in selected cases but are associated with longer half-lives and delayed recovery, making them less suitable for short procedures.²²

Topical anesthetics, triclofos, chloral hydrate, and melatonin are other medications. Children have been given melatonin as a premedicant 60 minutes before induction at a dose of 0.25–0.5 mg/kg, with various degrees of success. A nonbarbiturate, chloral hydrate can be injected orally (20–5 mg/kg), and it takes 30–45 minutes for drowsiness to set in. Since triclofos is less irritating to the stomach and has a greater palatability than chloral hydrate, it is frequently used as a sedative.²¹

The most effective way to administer medication to youngsters is yet unknown. The oral, nasal, and rectal are the most often utilized. Parenteral routes should usually not be used unless an IV cannula has been positioned beforehand. Although oral administration is widely used, its bioavailability is low. Rectal administration may not be suitable for older children and may cause expulsion in younger children. Since an intramuscular method is invasive and painful, it is not advised. Transmucosal routes, such as intranasal, sublingual, and buccal, may be more beneficial because of their high vascularization and capacity to evade first-pass metabolism. Compliance with nasal sedation may be easier to achieve in young children than with oral sedation. One drawback of the nasal route is that it might cause burning and nose discomfort.²¹

5. CONCLUSION

Preoperative anxiety in children is a significant clinical concern influenced by patient, parent, and environmental factors. Both pharmacologic and non-pharmacologic interventions play essential roles in its management. Non-pharmacologic strategies-such as education, behavioral techniques, PPIA, and CAM-offer safe, effective, and individualized approaches. When appropriate, pharmacologic agents can complement these methods. A combined, evidence-based strategy remains key to improving perioperative experiences and outcomes in pediatric patients.

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Conflict of Interest Statement:

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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