

PREOPERATIVE ANXIETY IN CHILDREN RISK FACTORS AND NON-PHARMACOLOGICAL MANAGEMENT

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Abstract

It is important for anesthesiologists to appreciate the impact of preoperative anxiety in children. Not only does it cause suffering in many children prior to their surgical experience, it has a negative impact on their postoperative recovery and possibly long afterwards. Because of these concerns, continued research is warranted to seek ways of minimizing their fears in the perioperative setting. In this review, we will examine the risk factors for preoperative anxiety, tools for quantifying children and parent's anxiety, and strategies that may play a part in decreasing preoperative anxiety. Variables, which influence preoperative anxiety in children, include their age, temperament, prior hospital experience and parent coping abilities. This review will also explore issues surrounding parental presence during a child's anesthesia induction and how understanding child development can enhance their cooperativeness during the preoperative period, especially during anesthesia induction. Non-pharmacological interventions as a means of decreasing pediatric anxiety will be explored. Finally recent trends and new directions will be touched upon.

Introduction

Means of conquering children's anxiety in a surgical setting has long been sought after. Children requiring anesthesia services for surgery or diagnostic procedures are especially likely to be anxious, as are their parents. In the United States alone, more than 3 million anesthetics are delivered to children annually¹. Many others visit emergency rooms or doctors offices for minor invasive procedures, dental work or diagnostic tests. Pre-procedural and especially preoperative anxiety is a piece of the larger problem of anxiety associated with medical environments in children. Various medical staff, parents and pediatric patients, themselves, strongly desires a better understanding of how to successfully promote a calm and pleasant preoperative experience.

A child's surgery is often a very significant and memorable event in the life of an entire family but especially the child's personal history. Unlike other significant events in the child's life (such as vacation, birthdays, visit to the zoo) this visit has an element of "threat". The fear of the unknown can be overwhelming.

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It is not surprising therefore that up to 65 % of children experience significant anxiety associated with the preoperative period².

In addition to its impact on postoperative outcomes, preoperative anxiety is an extremely unpleasant sensation for children. It is experienced in children by feelings of tension, dread, nervousness and uncertainty about their fate. Some may vocalize their fears while others manifest it in behavior such as crying, agitation, and cessation of conversation or play and even attempting to escape from care providers. This is accompanied by significant physiological changes such as increase in heart rate and secretion of stress hormones³. The effect of preoperative anxiety on postoperative outcomes have been recognized in studies dating back 50 years that found a correlation between preoperative anxiety and post-operative maladaptive behavioral changes^{2,4}. These include general anxiety, nighttime crying, enuresis, separation anxiety, and temper tantrums⁵⁻⁷ and can hinder the ability of children to cope with unfamiliar environments such as future medical encounters. Additionally, increases in postoperative pain and emergence delirium⁸ are significant post-operative concerns, which can cause negative behavioral changes. The relationship of increased risk of aspiration or PONV with anxiety in children has not been borne out by studies^{9,10}.

As many as 67% of children may develop postoperative negative behavioral changes including general anxiety, apathy and withdrawal, separation anxiety, sleep disturbances, aggression towards authority, and eating disturbances. Children who exhibit more anxiety preoperatively may be 3 times more likely to exhibit such negative behaviors. Although studies have shown the frequency of these behaviors to decrease rapidly over time, concern remains that in some children this may have long term negative impact on their future healthcare interactions and potentially hinder normal development¹¹. Among the large percentage of pediatric patients who suffer from severe preoperative anxiety, anesthesia induction is known to be the most anxiety provoking part of the preoperative experience^{6,12}. Awake IV placement and parental separation are other vulnerable time points. Therefore, a lot of the research focuses on managing distress at these time points.

Risk Factors and Prediction of Preoperative Anxiety in Children

With an understanding of risk factors for children and parents likely to develop significant preoperative anxiety, it is hoped that these “at-risk” patients can be identified in advance; an appropriate strategy can be directed towards them to reduce the impact of these factors and improve perioperative outcomes¹³.

Child Factors

Age: Separation anxiety may be present as early as 9 months and peaks at 1 year. Children age 1-5 are at most risk for experiencing severe preoperative anxiety^{6,7}.

Temperament: Shy or inhibited children and those with a high IQ with poor social adaptive abilities are more prone to anxiety⁷.

Previous medical encounters: Negative memories of previous hospital experiences, pediatrician or dentist visits⁷ can last into adolescence¹⁴.

Attachment style and quality of parent-child relationship: Beginning infancy an attachment style is developed determined by the quality of relationship with parents. A poorly attended infant may develop poor coping skills in new settings¹⁵.

Biologically based vulnerabilities: Children with increased sensitivity to novelty and transition and developmental delay are more prone to anxiety in unfamiliar surroundings.

One study suggested drawings by children in the preoperative waiting room might provide clues to their level of anxiety¹⁶.

Parental Factors

Children of anxious parents who use avoidant coping mechanisms and of divorced or separated parents are more anxious¹³. Predictors of increased parental anxiety, itself a risk factor, are gender of the parent (mothers are more anxious), parents of infants, of children who have been through repeated hospitalizations and baseline temperament of the child¹³. Parents accompanying children have physiological responses (Heart rate variability¹⁷, salivary amylase levels¹⁸) that correlate with their children's preoperative behavior.

Perioperative Environmental Factors

In one study, increased levels of anxiety in children was associated with increased number of people in the room at induction of anesthesia, longer waiting time between admission at the hospital and induction of anesthesia, negative memories of previous hospital experiences, and having a mother who does not practice a religion¹⁹.

Stimuli: Children are found to be less anxious and showed increased compliance during induction when exposed to a single care-provider in a dimmed, quiet operating room with background music¹².

Anesthetic Techniques: (Inhalation vs. Intravenous induction) Preoperative anxiety may be higher in children who receive an IV before induction²⁰. However there are some advantages at induction of having an IV in situ²¹. This choice varies greatly with regional practice and patient age.

Personnel: Health care professionals can positively or negatively affect the anxiety level of children. Attending anesthesiologists who practice in pediatric settings are better than mothers in predicting the anxiety of children during induction of anesthesia²².

Assessment of Anxiety in Children and Parents

Most astute care providers are reasonably good at judging anxiety level of children in the first few minutes of the interview. However, these subjective assessments, even by parents, may be prone to error. Adolescents and older children are most prone to have their anxiety level underestimated by their outer apparent calm²³. This age group especially fears waking up during the surgery or not waking up at all²⁴.

For research in pediatric perioperative anxiety, more reliable measures are required. The most popular means of measuring pediatric anxiety has been the "Gold Standard", "State-Trait-Anxiety Inventory for Children (STAIC)²⁴", which is best used with children over the age of 5 years²⁵. It is a self-report questionnaire, takes approximately 5-10 minutes to complete, but may lack practicability in a busy operating room setting²⁵. Over the last decade, the modified-Yale Preoperative Anxiety Scale (m-YPAS) has become the measurement tool of choice for assessing preoperative anxiety^{25,26}. This scale determines a child's level of anxiety by

evaluating a series of behaviors from calm to severe. The m-YPAS is most appropriate to use prior to anesthesia induction²⁵. The Induction Compliance Checklist (ICC) may be a preferable anxiety -measuring tool at the child's anesthesia induction²⁷. For postoperative maladaptive behaviors, the Post-Hospital Behavioral Questionnaire (PHBQ) is widely used as a self-report questionnaire for parents^{12,28}.

Perioperative Adult Child Behavioral Interaction Scale (PACBIS) is a more recent scale for prediction of emergence delirium via preoperative assessment of behaviors, is real-time and has good validation²⁹. Another study supports the validity of a numeric 0-10 anxiety self-report scale to assess state anxiety in children as young as 7 yr, which may have advantage by virtue of simplicity³⁰.

Child Development For The Anesthesiologist

An appreciation of the stage of psychosocial development is important to target stage appropriate interventions towards the child. Among the many theories of child development stages, Erikson's psychosocial developmental stages can perhaps be applied most easily to the perioperative setting.

(See Table 1³¹⁻³⁵).

Table 1
Perioperative approach to children based on Erikson's psychosocial developmental stages

| Age | Stage of Psychosocial Development | Suggestions |
|---------|---|--|
| 0-1 Yrs | Building trust (for fulfillment of basic needs) Approx. 9 mo. separation anxiety begins | Soothed by: pacifier, cuddling, rocking, soft spoken voice Parental presence at induction of anesthesia (PPIA) |
| 1-3 Yrs | Autonomous / Egocentric. Often state with authority, "I do it!" Sensory aspects important Fear abandonment Understands more than they verbalize back Most critical coping skill is PLA Y Time frames not distinguishable | Age appropriate, simple explanations "Hands-on" in simple language (what will hear, see, smell, feel) PPIA Provide simple choices Distraction E.g. "We will go home at Lunchtime" |

| | | |
|-----------|--|--|
| 4-5 Yrs | <p>Reality and fantasy not distinguishable</p> <p>Most critical coping skill is PLAY</p> <p>Like making choices</p> <p>Magic & pretend are fun</p> <p>Sensory aspects important</p> <p>Time frames difficult to understand</p> <p>Separation anxiety</p> | <p>E.g. stretcher may be perceived as actually stretching a person. Careful with language medical supplies i.e. say, “finger sticker”, instead of “it’s like a band aid”. Band-aids associated with pain.</p> <p>Distraction by Play</p> <p>Flavor on the “mask”</p> <p>Allow child to explore basic medical supplies</p> <p>Be current with associations i.e. finger light is like “Buzz Lightyear’s” light. Most don’t know “E.T.”</p> <p>Associate with length of favorite show (i.e. “Takes as long two Dora shows”)</p> <p>PPIA</p> |
| 6-12 Yrs | <p>Like to take part in care</p> <p>Want to be told the truth</p> <p>Take information literally</p> | <p>Provide choice to help hold anesthesia mask or which finger to place finger sticker</p> <p>Be honest about tastes of medicine or pain on IV insertion</p> <p>Careful with language i.e. “put to sleep” similar to how family dog was put down). This (Propofol) will “burn” interpreted as arm may set on fire</p> |
| 13-18 Yrs | <p>Age of identity</p> <p>Privacy is important</p> <p>Very self-conscious</p> <p>Fear waking up during surgery and possibility of death</p> | <p>Can provide more detail about medical procedures</p> <p>Inquire about teens personal information in private</p> <p>May prefer to change into hospital gown behind closed doors</p> <p>Verbal Reassurance of safety and monitoring and reversibility of anesthetic “sleep”</p> |

Adapted from: Ref. 31 – 35.

Strategies to Reduce Preoperative Anxiety

Premedication

Premedication forms an important arm of a multipronged strategy and in many practices is often the only means of managing preoperative anxiety in children. This aspect will be discussed in another chapter. This chapter will focus on non-pharmacological strategies.

Management of Preoperative Fasting

Fasting is an essential part of preoperative preparation and is often one of the most uncomfortable aspects for children. Humane and rational management of this necessity (evidence based policies, active communication with parents, monitoring of scheduling delays or changes) will help in reducing unnecessary distress in children³⁶.

Parental Presence at Induction of Anesthesia (PPIA)

Protecting one's offspring from a potential threat is an intense biological instinct that can be observed across boundaries of geography, history, culture, time and even species. It is not surprising that separation from their children, even for medically necessary procedures, is a stressful experience for parents and children. Majority of parents would prefer to stay with their children as long as possible in their perioperative journey³⁷.

The following comment, from the mother of one of our patients, illustrates the emotions of many a parent:

"I am a mother of four and would not send my children in there, scared and alone. Some children have a blanket, some a stuffed animal, all in the name of security. There is nothing more safe and secure than the loving look of a mom, the soothing sound of her voice, or the comfort of her arms. I am grateful to be the security my children needed at this very scary time" N.B.

Does PPIA benefit children, parents, or neither? Previous research has shown PPIA to benefit the child during anesthesia induction, promote parent satisfaction and present an anchor of security^{38,39}. PPIA was also shown to promote a smoother anesthesia induction for the child^{39,40}. There remain regional and international differences in acceptance of PPI, for example more anaesthetists in the UK allow PPIA than their counterparts in the US, although there are trends towards increased acceptance⁵. This increase may be credited to increased research efforts and better understanding from the anesthesia team regarding parent's participation^{5,26}. In addition, parents are increasingly aware of the possibility of PPIA and have raised expectations. For anesthesiologists it remains a challenge to balance their personal and institutional approach to PPIA with the desire of many parents to maximize their involvement. This is further complicated by a paucity of high-level evidence that supports PPIA despite an intuitive expectation it would reduce anxiety in most children⁴¹. Kain et al did not demonstrate a benefit in either preoperative anxiety, compliance with induction or post operative delirium vs. parent absent induction, while premedication with midazolam was superior to PPIA⁴². In another study there was no incremental benefit of PPIA when added to premedication with midazolam⁴³.

Two recent systematic reviews did not favor PPIA over other methods^{41,44}. Reviewers for the Cochrane collaboration summarized their review of 8 trials of PPIA as showing no significant differences in anxiety or cooperation of children during induction except for one trial where parental presence was significantly less effective than midazolam in reducing anxiety⁴⁴. A recent study showed the benefit of parental presence at separation that did not extend to placement of the anesthesia mask⁴⁵.

Why PPIA may not be effective on its own: The structure of randomized trials should be considered in appreciation of evidence for PPIA. Randomized controlled trials (RCTs) reflect the results of centers which offer PPIA to all parents. Results may differ where anesthesiologists selectively consider PPIA based on personality characteristics of each child and parent. Secondly allowing parental presence without adequate preparation may have a negative effect, causing more distress if they exhibit behaviors like excessive reassurance, criticism or commands⁴⁶. Therefore, research has turned its focus on the individual factors

surrounding PPIA like quality and timing of parent- child preparation and what parents actually do while present, rather than simply their presence or absence at induction^{46,47}. PPIA on its own was found to be effective in select circumstances related to the age and baseline anxiety levels of the child and parent⁴⁸. In their review of 568 subjects studied over the course of 7 years, Kain et al observed that calm child-anxious parent combination received the least benefit from PPIA⁴⁹.

What do parents experience and want: PPIA can be a stressful experience for parents. Upsetting events for them can be their child in distress, going limp or rolling their eyes and having to leave their child⁵⁰. There is evidence of increased skin conductance levels and rise in heart rates in mothers at PPIA indicating heightened arousal; However, abnormal EKG findings were not observed⁵¹.

It has been found that parents overwhelmingly prefer PPIA for their child's subsequent surgery, regardless of their first experience and majority choose PPIA over premedication in subsequent surgeries⁵².

Objections to PPIA: Many anesthesiologists are concerned about increased stress on the OR team, reduced efficiency, distraction from the care of patient and teaching of trainees, liability for the parental injury^{53,54}, the possibility that the parent would not want to leave at the appropriate time or may become combative. It seems prudent to allow parents to be present with appropriate disclosure and precautions but not invite parents who do not wish to be present. Each institution should consult with its legal team to formulate a sound policy regarding PPIA. Anesthesiologist anxiety about parental presence at induction decreases significantly with experience⁵⁵ and differs with type of practice. Pediatric anesthesiologists and anesthesiologists who routinely take care of children are more likely to allow PPIA.

Summary: "No parent should ever be forced to be present for induction of anesthesia, nor should any anesthesiologist be forced into a situation that compromises the quality of care"⁵⁶. PPIA is becoming more widely accepted and may be beneficial with appropriate preparation.

Other Non-Pharmacological Interventions

1. Before the hospital: The preoperative journey often starts with the child's pediatrician. This is a good opportunity for pediatricians to develop more awareness of preoperative issues and start educating the parents at an early stage⁵⁷. Communication between the pediatrician and the anesthesia team about the child's unique needs can be helpful.

2. The preoperative interview: The preoperative interview is a routine "behavioral intervention"⁴⁶ that is an opportunity for the anesthesiologist to assess the child, develop rapport with the child and family, provide them with a detailed anesthesia plan and provide reassurance that their child will be well protected. The often daunting task of going over the risks of anesthesia in detail is concerning to many anesthesiologists lest it provoke parental and child anxiety. This is not supported by evidence. In fact the parents who received more detailed risk information were no more anxious than those who did not⁵⁸. Children also deserve (and desire) an age appropriate explanation of what to expect⁵⁹. An empathetic interview and informed consent requires honesty, expertise, self-confidence, patience and superior communication skills. Parents often fear anesthesia more than surgery. The communication skills of the anesthesiologists (and nurses) are very important in building trust with the family. In a satisfaction survey of parents and children "lack of fear at the moment of being anesthetized, and lack of anxiety on the day preceding surgery, were attributed to the serenity transmitted by the anesthetist and nurses"⁶⁰.

The approach of anesthesiologists and the perioperative team should be customized to the individual child. For example, not all children will require premedication and not all children under a certain age prefer an inhalational induction. The cooperative child may have previously conquered IV placements and is confident in beginning an anesthesia induction in this manner. The cooperative child may need a different inhalational technique than another who is non-compliant.

3. Preoperative information programs: Many approaches can be used to deliver preoperative information to educate children and parents. For example, information leaflets⁶¹, interactive books⁶², videos⁶³, tours of the facility have been shown to have a positive but variable impact on preoperative anxiety. Modeling by videos is more effective if it is facility specific⁶⁴. An informational Saturday Morning Camp in the UK had favorable effects on preoperative anxiety but significance was limited to the waiting room and the authors did not recommend widespread adoption⁶⁵.

Giving appropriate information and age-appropriate medium are important. For example, effort should go into researching what parents actually want to know for better results⁶⁶. Similarly adolescents expressed more satisfaction with an Internet based program⁶⁷.

Visitation has logistical and cost issues and may have limited usefulness. Coordinating visits with the family's other obligatory trips to the hospital is advisable to reduce the burden on them. In the age of multimedia telecommunication there are many alternatives to an informational visit.

4. Behavioral Interventions Programs: The ideal behavioral preparation should be effective in reducing anxiety, should be low cost in terms of personnel and time, should be easy to administer (ideally by trained parents) and should not necessitate separate visits to the hospital.

The most effective behavioral interventions are development of coping skills, followed by modeling, play therapy, operating room tour and printed material⁶⁸. Coping skills can range from simply suggesting deep breathing and counting to promoting distraction activities such as a favorite DVD or handheld game. Distraction is considered a very effective form of coping for younger children⁶⁹. When anxiety is decreased through preparation and play, children become more confident and cope better with medical procedures.

Kain et al found that an elaborate and costly behavioral preoperative program had limited anxiolytic effects and did not have significant impact on the induction of anesthesia⁷⁰. More recently a comprehensive family centered approach in the form of the ADVANCE preparation program was shown to be effective in the reduction of preoperative anxiety and improvement in postoperative outcomes like reducing emergence delirium⁷¹. However costs were noted to be significant and may preclude widespread adoption.

MacLaren et al have recently demonstrated that a simple behavioral intervention based on exposure (to anesthesia mask) and shaping resulted in increased compliance at induction and has the advantage of being administered by parents in the holding area on day of surgery, thus increasing its application. It may represent an effective intervention in a time and resource-constrained environment (Fig. 1)⁷².

Fig. 1



The role of child- life specialists (or play specialists in some countries) is worth mentioning. A child life specialist is specifically trained in child development. There are about 4000 certified child life-specialists worldwide⁷³. The majority of large hospitals in the US staff certified child-life specialists (CCLS) and preparation programs are standard in many pediatric hospitals⁷⁴; however there is a vast degree of variability in approach and program implementation, especially in perioperative settings. The primary role of the CCLS is to provide families and children with individualized psychosocial care that should be tailored to their needs such as age, developmental level and previous experience. The three most important aspects of high quality preparation include the provision of developmentally appropriate information, the encouragement of emotional expression and the formation of a trusting relationship with a healthcare professional. These components remain the principal base of preparation for over thirty years⁶⁸. The role of the child life specialist is to promote the child's confidence and cooperation perioperatively. They use sensory-based preparation for what children will experience preoperatively, and this is proven to be an effective means of managing preoperative anxiety as opposed to verbal information alone. Most importantly, child life specialists promote play as a means of helping children cope with the often intimidating perioperative setting. Play allows children to relax and reduces their anxiety, which then allows them to become less defensive⁷⁵.

In our practice, the CCLS have significantly reduced the need for premedication and have generated increased parent satisfaction. They have also allowed the anesthesia team to function in an efficient manner by allowing them more time to concentrate on clinical concerns. The comparative effectiveness and economical impact of a CCLS based preparation program should be an interesting area for further study.

In summary, preparation programs based on behavioral interventions have had a mixed record of success suggesting that preparation is not as simple as it appears³⁷. The details of a child's prior hospitalization experiences, age, and timing relative to surgery are important variables. Preparation should be provided at least

5 days in advance for children > 6 years and no more than a week in advance for children < 6 years. Individualized coping skills training rather than modeling are more beneficial to children who have prior hospital experiences as they are not provided with new information and may actually have negative effects with re-exposure to medical equipment^{26,37}.

5. Distraction Activities and Play: Various distraction strategies have been found to be useful in reducing preoperative anxiety. The importance of allowing children to get involved in or carry on play activities cannot be overestimated. Play comes naturally to children and is often their favorite activity. Providing an environment conducive to play activities⁷⁶, toys⁷⁷ or using existing handheld game technology to make the environment less threatening (Fig. 2), has been shown to reduce anxiety⁷⁸, enhance cooperation of children with medical procedures⁷⁹ and anesthesia induction. The PediSedate® device is an interesting combination of a child friendly gaming console and nitrous oxide delivery device, well received by older children, but is associated with increased PONV. Even readily available smart phones (e.g. iPhone)⁸⁰ and web-based entertainment (you Tube)⁸¹ can be used as distraction aids. Devices like video-goggles have the dual advantage of distraction and shielding the view of a harsh-looking operating room (Fig. 3).

In our practice, our CCLS facilitate play to be carried through to the Operating room and during induction of anesthesia. (Fig. 4 and 5).

Fig. 2 & 3





The presence of medically trained clowns in the perioperative area has been shown to be an effective measure though acceptance by the operating team has been a challenge⁸². However in another study anxiety at mask placement was not reduced⁸³.

Music therapy has been effective in adults as an anxiolytic but its impact on children has been modest. Interactive music therapy may relieve anxiety on separation and entrance to the operating room but appears less effective during the induction of anesthesia⁸⁴.

Fig. 4 & 5

6. Complementary and Alternative Medicine Strategies: Some interesting work has shown the effectiveness of hypnosis⁸⁵ in children as well as use of acupressure at the extra-1 point⁸⁶. Hypnosis alleviated preoperative anxiety, especially during induction of anesthesia and reduced behavioral disorders during the first postoperative week. Another study demonstrated that auricular acupunctures in anxious mothers was effective in reducing maternal anxiety and enhancing the child's cooperation at induction⁸⁷.

7. Child Friendly Environment: The design of the operating room suite, color scheme, flow process and décor are important tools to enhance feelings of comfort in children and reduce the sense of threat (Fig. 6).

Fig. 6



Recorded maternal voice was effective in reducing perioperative anxiety and emergence phenomenon during cardiac catheterization in children⁸⁸.

8. Behavioral Interventions Targeting Care Providers: An intriguing area of study is to target perioperative provider behavior, which have shown to influence preoperative anxiety in children. Desired behaviors (*coping promoting*) by parents and medical staff include approaches like distraction, humor, and non-procedure related talk. Undesired behaviors (*distress promoting*) include excessive reassurance, empathetic comments, apologies and criticism and may actually increase anxiety. In a multicenter pilot study, educational interventions to target specific provider behaviors resulted in increases in “*coping promoting behaviors*” and reduction in children’s anxiety levels⁸⁹.

Recent Trends and Future Directions

It is increasingly recognized that addressing preoperative anxiety should be a multimodal effort. Provider behavior may be another contributory factor amenable to positive change. Easy access to economical portable entertainment technology has increased the options for distraction and play to enhance child’s coping skills. Virtual reality may provide another modality⁹⁰. Attention has focused on attempting to improve postoperative behavioral recovery by reducing preoperative anxiety. There are indications that such efforts may also influence clinical recovery, such as reducing postoperative pain⁹¹.

The child-parent combination is “joined at the hip” and requires a comprehensive approach by the medical facility to address its collective need for information, empathy and reassurance. The child-parent unit is a package deal and addressing the child’s preoperative anxiety requires addressing both their concerns. A

successful program will require a commitment to this comprehensive approach by the entire facility including staff training, architectural design (child-friendliness) and layout (access to play space). In a recent article, Chorney et al argue for such an approach including families in the entire perioperative experience of the child-family unit, not just the preoperative period. “.. Families are an integral part of the perioperative care team and should be treated as such. Efforts should be made to establish collaborations by openly communicating, developing a shared vision for the care of the child, and building a cohesive care team that includes healthcare providers and family members throughout the perioperative period”³⁷. In order for this to become the standard of care, pediatric and general hospitals need to commit significant resources and anesthesiology residency programs need to include this philosophy in the education of future (and re-education of current) practitioners.

Conclusions: Promoting a positive perioperative experience is best achieved through comprehensive, age appropriate preparation of the child, as well as the parents, for what to expect. To be successful, a family centered approach has to encompass the entire journey of the child through the perioperative period and has to utilize all suitable resources, personnel and strategies. Anesthesiologists are likely to remain important conductors of this multifaceted effort. Anesthesiologists taking care of children should recognize the risk factors, and individualize management of perioperative anxiety in a family-centered environment.

References

1. KAIN ZN, CALDWELL-ANDREWS AA, WANG S-M: Psychological preparation of the parent and pediatric surgical patient. *Anesthesiology Clinics of North America*; 2000, 20(1):29-44.
2. DREGER VA, TREMBECK TF: Management of perioperative anxiety in children. *AORN Journal*; 2006, 84(5):788-804.
3. KAIN ZN, MACLAREN J, MAYES LC: Perioperative Behavior Stress in Children. In: Cote CJ, Lerman J, ID Todres, Eds. *A Practice of Anesthesia for Infants and Children*. Philadelphia, PA: Saunders Elsevier; 2009, 26.
4. WATSON AT, VISRAM A: Children's preoperative anxiety and postoperative behavior. *Paed Anaesth*; 2003, 188-204.
5. KAIN ZN, CALDWELL-ANDREWS AA, KRIVUTZA DM, WEINBERG ME, WANG S-M, GAAL D: Trends in the practice of parental presence during induction of anesthesia and the use of preoperative sedative premedication in the United States, 1995-2002: Results of a follow-up national survey. *Ped Anesth*; 2004, 98:1252-1259.
6. KAIN, ZN, MAYES, LC, O'CONNOR, TZ, CICCETTI, DV: Preoperative anxiety in children: Predictors and outcomes. *Arch Ped Adol Med*; 1996, 150(12):1238-1245.
7. MCCANN M, KAIN ZN: "Management of Preoperative anxiety in children: an update". *Anesth Analg*; 2001, 93:98-105.
8. THOMPSON C, MACLAREN J, HARRIS A, KAIN ZN: Brief report: Prediction of children's preoperative anxiety by mothers and fathers. *J Ped Psychol*; 2008, 34(7):716-721.
9. KAWANA S, UZUKI M, NAKAE Y, NAMIKI A: Preoperative anxiety and volume and acidity of gastric fluid in children. *Ped Anaesth*; 2000, 10(1):17-21.
10. WANG SM, KAIN ZN: Preoperative anxiety and postoperative nausea and vomiting in children: Is there an association? *Anesth Analg*; 2000, 90(3):571-575.
11. KAIN ZN, WANG SM, MAYES LC, ET AL: Distress during the induction of anesthesia and postoperative behavioral outcomes. *Anesth Analg*; 1999, 88:1042-1047.
12. KAIN ZN, WANG S-M, MAYES LC, KRIVUTZA DM, TEAGUE BA: Sensory stimuli and anxiety in children undergoing surgery: A randomized, controlled trial. *Anesth Analg*; 2001, 92:897-903.
13. KAIN ZN, MACLAREN J, MAYES LC: Perioperative Behavior Stress in Children. In: Cote CJ, Lerman J, and ID Todres, Eds. *A Practice of Anesthesia for Infants and Children*. Philadelphia, PA: Saunders Elsevier; 2009, 27.
14. KOROLUK LD: Dental anxiety in adolescents with a history of childhood dental sedation. *J Dentistry for Children*; 2000, 67(3):200-205, 161.
15. TURNER JC: Theoretical Foundation of Child Life Practice, in *The Handbook of Child Life, a Guide for Pediatric Psychosocial Care*. Thompson RH Editor, Springfield, Illinois: Charles Thomas; 2009, 28.
16. PUURA A, PUURA K, RORARIUS M, ANNILA P, VIITANEN H, BAER G: Children's drawings as a measure of anxiety level: a clinical pilot study. *Paed Anaesth*; 2005, 15(3):190-193.
17. ARAI YC, UEDA W, USHIDA T, KANDATSU N, ITO H, KOMATSU T: Increased heart rate variability correlation between mother and child immediately pre-operation. *Acta Anaesth Scand*; 2009, 53(5):607-10.
18. ARAI YC, KANDATSU N, ITO H, ET AL: Induction and emergence behavior of children undergoing general anesthesia correlates with maternal salivary amylase activity before the anesthesia. *Acta Anaesth Scand*; 2008, 52(2):285-8.
19. WOLLIN SR, PLUMMER JL, OWEN H, HAWKINS RM, MATERAZZO F: Religion, spirituality, psychiatry: A new era in mental health care. *Anaesth Inten Care*; 2003, 31(1):69-74.
20. AGUILERA IM, PATEL D, MEAKIN GH, MASTERSON J: Perioperative anxiety and postoperative behavioural disturbances in children undergoing intravenous or inhalation induction of anaesthesia. *Paed Anaesth*; 2003, 13(6):501-7.
21. ZIELINSKA M, HOLTBY H, WOLF A: Pro-con debate: Intravenous vs. inhalation induction of anesthesia in children. *Ped Anesth*; 2011, 21:159-168.
22. MACLAREN JE, THOMPSON C, WEINBERG M, ET AL: Prediction of preoperative anxiety in children: who is most accurate? *Anesth Analg*; 2009, 108(6):1777-82.
23. BAYNE A, KIRKLAND P: Prepare children for surgery one stage at a time. *OR Nurse Journal*; 2008, 36-39.
24. SPIELBERGER CD: *Manual for the State-Trait Anxiety Inventory (STAI: Form Y)*. Palo Alto CA: Consulting Psychologists Press, 1983.
25. KAIN ZN, MAYES L, CICCETTI D, ET AL: The Yale Preoperative Anxiety Scale: How does it compare with a "gold standard?" *Anesth Analg*; 1997, 85:783-788.
26. WRIGHT K, STEWART S, FINLEY, GA, BUFFETT-JERROTT S: Prevention and Intervention Strategies to alleviate preoperative anxiety in children: A critical review. *Behavior Modification*; 2007, 31:52-79.
27. KAIN ZN: Postoperative maladaptive behavioral changes in children: Incidents, risk factors, and interventions. *Acta Anesthesiol Belg*; 2000, 51: 217-226.
28. VERNON D, THOMPSON R: Research on the effect of experimental interventions on children's behavior after hospitalization: A review and synthesis. *Develop Behavio Ped*; 1993, 14:36-44.

29. SADHASIVAM S, COHEN LL, SZABOVA A, ET AL: Real-time assessment of perioperative behaviors and prediction of perioperative outcomes. *Anesth Analg*; 2009, 108:(3):822-6.
30. CRANDALL M, LAMMERS C, SENDERS C, SAVEDRA M, BRAUN JV: Initial validation of a numeric zero to ten scale to measure children's state anxiety. *Anesth Analg*; 2007, 105:(5):1250-3.
31. FORDHAM LA: Approach to the pediatric patient. *Ultrasound Clin*; 2009, 4:439-443.
32. COLLARUSSO CA: Psychological approach to the pediatric patient. In: Edwards DK & Hilton SVW, eds. *Practical Pediatric Radiology*. Philadelphia, PA: Saunders Elsevier; 2006, 642.
33. DIXON SD, STEIN MT: Encounters with children: *Pediatric Behavior and Development*; St. Louis, MO: Mosby, 2000.
34. GOLDBERGER J, GAYNARD L: Helping children cope with health care procedures. *Contemporary Pediatrics*; 1990, 154.
35. TURNER JC: Theoretical foundations of child life practice. In: Thomson RH, Ed. *The Handbook of Child Life: A Guide for Pediatric Psychosocial Care*; Springfield, IL: Charles Thomas, 2009, 30.
36. CASTILLO-ZAMORA C, CASTILLO-PERALTA, LA, NAVAOCAMPO AA: Randomized trial comparing overnight preoperative fasting period vs. oral administration of apple juice at 06:00-06:30 AM in pediatric orthopedic surgical patients. *Ped Anesth*; 2005, 15:638-642.
37. CHORNEY JM: Family-centered pediatric perioperative care. *Anesthesiology*; 2010, 112:(3):751-755.
38. HENDERSON, MA, BAINES, DB, OVERTON JH: Parental attitudes to presence at induction of pediatric anesthesia. *Anaesth Inten Care*; 1993, 21:324-327.
39. ZELIKOVSKY N: Parental participation during induction stage of children's anesthetic procedures in Israel. *Seminars in Perioperative Nursing*; 1996, 5:(4):213-217.
40. MCCORMICK ASM, SPARGO PM: Parents in the anesthetic room: A questionnaire survey of departments of anesthesia. *Paed Anaesth*; 1996, 6:183-186.
41. CHUNDAMALA J, WRIGHT JG, KEMP SM: An evidence-based review of parental presence during anesthesia induction and parent/child anxiety. *Can J Anaesth*; 2009, 56:(1):57-70.
42. KAIN ZN, MAYES LC, WANG SM, ET AL: Parental presence during induction of anesthesia versus sedative premedication: Which intervention is more effective? *Anesthesiology*; 1998, 89:1147-1156.
43. KAIN ZN, MAYES LC, WANG SM, CARAMICO LA, KRIVUTZA DM, HOFSTADTER MB: Parental presence and a sedative premedicant for children undergoing surgery: A hierarchical study. *Anesthesiology*; 2000, 92:(4):939-946.
44. YIP P, MIDDLETON P, CYNA AM, CARLYLE AV: Non-pharmacological interventions for assisting the induction of anaesthesia in children (Review). *The Cochrane Collaboration*. Wiley Publishers, 2009, 3:1-64.
45. WRIGHT KD, STEWART SH, FINLEY GA: When are parents helpful? A randomized clinical trial of the efficacy of parental presence for pediatric anesthesia. *Can J Anaesth*; 2010, 57:(8):751-758.
46. KAIN ZN, MACLAREN J, MAYES LC: Perioperative Behavior Stress in Children. In: Cote CJ, Lerman J, ID Todres, Eds. *A Practice of Anesthesia for Infants and Children*; Philadelphia, PA: Saunders Elsevier; 2009, 30-31.
47. CALDWELL-ANDREWS A, BLOUNT R, MAYES L, KAIN Z: Behavioral interactions in the perioperative environment: a new conceptual framework and the development of the perioperative child-adult medical procedure interaction scale. *Anesthesiology*; 2005, 103:1130-1135.
48. KAIN ZN, MAYES LC, CARAMICO LA, SILVER D, SPIEKER M, NYGREN MM, ANDERSON G, RIMAR S: Parental presence during induction of anesthesia. A randomized controlled trial. *Anesthesiology*; 1996 May, 84(5):1060-7.
49. KAIN Z, CALDWELL-ANDREWS A, MARANETS I, ET AL: Predicting which child-parent pair will benefit from parental presence during induction of anesthesia: a decision-making approach. *Anesth Analg*; 2006, 102:81-84.
50. VESSEY JA, BOGETZ MS, CASERZA CL, LIU KR, CASSIDY, MD: Parental upset associated with participation in induction of anaesthesia in children. *Can J Anaesth*; 1994, 41:(4):276-80.
51. KAIN ZN: Caldwell-Andrews AA. Mayes LC. Wang SM. Krivutza DM. LoDolce ME. Parental presence during induction of anesthesia: physiological effects on parents. *Anesthesiology*; 2003, 98(1):58-64.
52. KAIN ZN, CALDWELL-ANDREWS AA, WANG SM, KRIVUTZA DM, WEINBERG ME, MAYES LC: Parental intervention choices for children undergoing repeated surgeries. *Anesth Analg*; 2003, 96:(4):970-975.
53. KAIN ZN, MACLAREN J, MAYES LC: Perioperative Behavior Stress in Children. In: Cote CJ, Lerman J, ID Todres, eds. *A Practice of Anesthesia for Infants and Children*; Philadelphia, PA: Saunders Elsevier; 2009, 30-31.
54. LEWYN MJ: Should parents be present while their children receive anesthesia?. *Anesth Malpract Protect*; 1993, May, 56-57.
55. HANNALLAH RS, ABRAMOWITZ MD, OH TH, RUTTIMANN UE: Residents' attitudes towards parents' presence during anesthesia induction in children: does experience make a difference?. *Anesthesiology*; 1984, 60:598-601.
56. GHAZAL EA, MASON LJ, COTE CJ: Preoperative Evaluation, Premedication, and Induction of Anesthesia. In: Cote CJ, Lerman J, ID Todres, eds. *A Practice of Anesthesia for Infants and Children*; Philadelphia, PA: Saunders Elsevier, 2009, 41.
57. ZUCKERBERG AL: Perioperative approach to children. *Ped Clin N Amer*; 1994, 41:(1):15-29.
58. KAIN ZN, WANG SM, CARAMICO LA, ET AL: Parental desire for perioperative information and informed consent: a two-phase study. *Anesth Analg*; 1997, 84:299-306.
59. FORTIER MA, CHORNEY JM, RONY RY, ET AL: Children's desire for perioperative information. *Anesth Analg*; 2009, 109:(4):1085-1090.

60. IACCOBUCCI T, FEDERICO B, PINTUS C, DE FRANCISCI G: Evaluation of satisfaction level by parents and children following pediatric anesthesia. *Paed Anaesth*; 2005, 15:(4):314-320.
61. BELLEW M, ATKINSON KR, DIXON G, YATES A: The introduction of a paediatric anaesthesia information leaflet: an audit of its impact on parental anxiety and satisfaction. *Ped Anaesth*; 2002, 12:(2):124-30.
62. MARGOLIS JO, GINSBERG B, DEAR GL, ROSS AK, GORAL JE, BAILEY AG: Paediatric preoperative teaching: effects at induction and postoperatively. *Paed Anaesth*; 1998, 8(1):17-23.
63. McEwen A, Moorthy C, Quantock C, Rose H, Kavanagh R. The effect of videotaped preoperative information on parental anxiety during anesthesia induction for elective pediatric procedures. *Paed Anaesth*; 2007, 17:(6):534-9.
64. LEROY S, ELIXSON EM, O'BRIEN P, TONG E, TURPIN S, UZARK K: Recommendations for preparing children and adolescents for invasive procedures. *Circulation*; 2003, 08:2550-2564.
65. RICE M, GLASPER A, KEETON D, SPARGO P: The effect of a preoperative education programme on perioperative anxiety in children: An observational study. *Paed Anaesth*; 2008, 18:(5):426-30.
66. WISSELO TL, STUART C, MURIS P: Providing parents with information before anaesthesia: What do they really want to know? *Paed Anesth*; 2004, 14:299-307.
67. O'Conner-Von S. Preparation of adolescents for outpatient surgery: using an Internet program. *AORN J*; 2008, 87:(2):374-398.
68. KOLLER, D: Preparing children and adolescents for medical procedures. Proceedings of the child life council evidence-based practice statement (pp. 1-13). Toronto, Canada: Child Life Council. August 2008.
69. GOLDBERGER J, GAYNARD L: Helping children cope with health care procedures. *Contemporary Pediatrics*; 1990, 158.
70. KAIN ZN, CARAMICO LA, MAYES LC, GENEVRO JL, BORNSTEIN MH, HOFSTADTER MB: Preoperative preparation programs in children: A comparative examination. *Paed Anesth*; 1998, 87:1249-1255.
71. KAIN ZN, CALDWELL-ANDREWS AA, MAYES LC, ET AL: Family-centered preparation for surgery improves perioperative outcomes in children: a randomized controlled trial. *Anesthesiology*; 2007, 106:(1):65-74.
72. MACLAREN JE, KAIN ZN: Development of a brief behavioral intervention for children's anxiety at anesthesia induction. *Children's Health Care*; 2008, 37:196-209.
73. HENKEL G: A coping mechanism: Child life specialists can ease hospital stays for pediatric patients. *ENT Today*. December 2010.
74. SORENSEN HL, CARD CA, MALLEY MT, STRZELECKI JM: Using a collaborative child life approach for continuous surgical preparation. *AORN J*; 2009, 90:(4):557-566.
75. THOMPSON RH, SNOW CW: Research in child life. In RH Thompson, ed. *The Handbook of Child Life: A Guide for Pediatric Psychosocial Care*. 2009, Springfield, IL: Charles Thomas, 36-56.
76. HOSSEINPOUR M, MEMARZADEH M: Use of a preoperative playroom to prepare children for surgery. *Euro J Ped Surg*; 2010, 20:(6):408-11.
77. GOLDEN L, MURALI P, SUKHAVASI S, NAGPAL D, AHMAD A, MAHANTA A. Giving toys to children reduces their anxiety about receiving premedication for surgery. *Anesth Analg*; 2006, 102:1070-172.
78. PATEL A, SCHEIBLE T, DAVIDSON M, TRAN MC, ET AL: Distraction with a hand-held video game reduces pediatric preoperative anxiety. *Paed Anesth*; 2006, 16:1019-1027.
79. DENMAN WT, TUASON PM, AHMED MI, BRENNAN LM, CEPEDA S, CARR DB: The PediSedate device, a novel approach to pediatric sedation that provides distraction and inhaled nitrous oxide: clinical evaluation in a large case series. *Paed Anesth*; 2007, 17:(2):162-166.
80. PITTAWAY AP, LOW DK: The 'iPhone' induction - a novel use for the Apple iPhone. *Paed Anaesth*; 2008, 18:(6):573-574.
81. GOMES SH: YouTube in pediatric anesthesia induction. *Paed Anaesth*; 2008, 18:(8):801-802.
82. VAGNOLI L, CAPRILLI S, MESSERI A: Parental presence, clowns or sedative premedication to treat preoperative anxiety in children: what could be the most promising option? *Paed Anaesth*; 2010, 20:(10):937-943.
83. GOLAN G, TIGHE P, DOBIJA N, PEREL A, KEIDAN I: Clowns for the prevention of preoperative anxiety in children: a randomized controlled trial. *Paed Anaesth*; 2009, 19:(3):262-266.
84. KAIN ZN, CALDWELL-ANDREWS AA, KRIVUTZA DM, WEINBERG ME, GAAL D, WANG SM, MAYES LC: Interactive music therapy as a treatment for preoperative anxiety in children: a randomized controlled trial. *Anesth Analg*; 2004, 98:(5):1260-1266.
85. CALIPEL S, LUCAS-POLOMENI MM, WODEY E, ECOFFEY C: Premedication in children: hypnosis versus midazolam. *Paed Anaesth*; 2005, 15:(4):275-281.
86. WANG SM, ESCALERA S, LIN EC, MARANETS I, KAIN ZN: Extra-1 acupressure for children undergoing anesthesia. *Anesth Analg*; 2008, 107:(3):811-816.
87. WANG SM, MARANETS I, WEINBERG ME, CALDWELL-ANDREWS AA, KAIN ZN: Parental auricular acupuncture as an adjunct for parental presence during induction of anesthesia. *Anesthesiology*; 2004, 100:(6):1399-404.
88. KIM SJ, OH YJ, KIM KJ, KWAK YL, NA S: The effect of recorded maternal voice on perioperative anxiety and emergence in children. *Anaesth Inten Care*; 2010, 38:(6):1064-9.
89. Changing Healthcare Providers' Behavior during Pediatric Inductions with an Empirically Based Intervention. Martin, SR, Chorney JM, Tan ET, Fortier MA, Blount RL, Wald SH, Shapiro NL, Strom, SL, Patel S, Kain ZN. *Anesthesiology*; 2011; 115(1):18-27.

90. Allaying Anxiety in Children: When a Funny Thing Happens on the Way to the Operating Room. Litman, RS. *Anesthesiology*; 2011, 115(1):4-5.
91. BRINGUIER S, DADURE C, RAUX O, DUBOIS A, PICOT M-C, CAPDEVILA X: The perioperative validity of the visual analog anxiety scale in children: A discriminant and useful instrument in routine clinical practice to optimize postoperative pain management. *Anesth Analg*; 2009, 109(3):737-744.