Can J Anesth/J Can Anesth (2009) 56:57–70
DOI 10.1007/s12630-008-9008-3

REVIEW ARTICLES/BRIEF REVIEWS

An evidence-based review of parental presence during anesthesia induction and parent/child anxiety

Une révision fondée sur des données probantes concernant la présence parentale pendant l'induction de l'anesthésie et l'anxiété parent/enfant

Josie Chundamala, MA · James G. Wright, MD · Sheelagh M. Kemp, MD

Received: 8 July 2008 / Revised: 14 October 2008 / Accepted: 28 October 2008 / Published online: 20 December 2008

Abstract

Purpose *The purpose of this evidence-based review was to examine the effect of parental presence during anesthesia induction on parents' and children's anxiety.*

Source *MEDLINE (1950 to 2008) and EMBASE (1980 to 2008) were searched. Studies were restricted to randomized controlled trials (RCTs) and comparative studies only (levels of evidence I–III).*

Principal findings *Fourteen studies that provided level II or level III evidence were included (nine RCTs, four prospective comparative studies, and one retrospective comparative study). Of the 10 studies that evaluated parents' anxiety, most did not find parental presence to be more effective than no parental presence, midazolam, or parental presence plus midazolam. Of the 11 studies that examined children's anxiety, most did not find parental presence to be more effective than no parental presence, midazolam, parental presence plus midazolam, or parental presence plus a video game.*

Conclusion *Contrary to popular belief, in most cases parental presence does not appear to alleviate parents' or children's anxiety. In the rare instances when it does seem to diminish parents' or children's anxiety, premedicating children with midazolam has shown to be a viable alternative. Other anxiety-reducing solutions, such as distracting children with video games, should also be considered.*

J. Chundamala, MA (✉) · J. G. Wright, MD
Department of Surgery, The Hospital for Sick Children, 555 University Avenue, Room 1218, Black Wing, Toronto, ON, Canada M5G 1X8
e-mail: josie.chundamala@sickkids.ca

S. M. Kemp, MD
Department of Anesthesia, The Hospital for Sick Children, Toronto, ON, Canada

Résumé

Objectif *L'objectif de cette révision fondée sur des données probantes était d'examiner les effets d'une présence parentale pendant l'induction de l'anesthésie sur l'anxiété des parents et des enfants.*

Source *Les bases de données MEDLINE (1950 à 2008) et EMBASE (1980 à 2008) ont été interrogées. Nous avons restreint notre sélection exclusivement aux études randomisées contrôlées (ERC) et aux études comparatives (niveaux de données probantes I-III).*

Constatations principales *Quatorze études fournissant des données probantes de niveau II et III ont été inclues (neuf ERC, quatre études comparatives prospectives, une étude comparative rétrospective). Parmi les dix études évaluant l'anxiété des parents, la plupart n'ont pas observé une efficacité accrue de la présence des parents, par rapport à aucune présence parentale, au midazolam, ou à la présence des parents plus midazolam. Parmi les 11 études portant sur l'anxiété des enfants, la plupart n'ont pas observé une efficacité accrue de la présence des parents, par rapport à aucune présence parentale, au midazolam, à la présence des parents plus midazolam ou à la présence des parents et un jeu vidéo.*

Conclusion *Contrairement aux croyances populaires, dans la plupart des cas la présence des parents ne semble pas réduire l'anxiété des parents ou des enfants. Dans les rares cas où cela semble réduire l'anxiété des parents ou* *des enfants, il a été observé que la prémédication des enfants avec du midazolam s'avérait une alternative viable. D'autres stratégies de réduction de l'anxiété, comme par exemple la distraction des enfants avec des jeux vidéo, devraient également être envisagées.*

When children are undergoing anesthesia, it is usually an anxiety-ridden time for both parent and child. Many strategies have been used to allay anxiety, including sedation for children, education for parents/children, and developing strong interpersonal relationships between hospital staff and parents/children, with a focus on rapport, communication, and honesty. Distraction techniques (i.e., audio/video devices, toys, and books), fun transportation systems (i.e., wagons), flavoured anesthesia masks, and minimal downtime/waiting before inductions have also been used to alleviate anxiety. Parental presence during anesthesia induction has also been utilized to minimize anxiety. For many, parental presence would intuitively reduce anxiety. However, parental presence is of uncertain effectiveness and, in some cases, could actually increase anxiety.

Permitting parental presence during induction varies markedly between and within hospitals. While parental presence is routine in some hospitals and actively discouraged in others, in many cases it is based on parental advocacy balanced with the preference of individual anesthesiologists carrying out the induction. Individual anesthesiologists consider many factors in determining whether parents should be allowed into the operating room suite. At our institution, factors that tend to favourably influence anesthesiologists to allow parents to be present include adequate staffing, availability of an area for induction close to the operating room, and induction during daytime hours. Parental presence is also more likely to be allowed within satellite locations, such as procedure rooms for hematology/oncology, endoscopy rooms, cardiology suites, radiation therapy and burn units, as well as diagnostic imaging units (e.g., magnetic resonance imaging). More cooperative, less anxious parents and those who have received some basic preoperative education are also more likely to be allowed into the operating room/diagnostic suite area during the anesthetic induction sequence. Other factors that tend to favour parental presence include administering patients with behavioural problems (i.e., autism) or developmental delay (e.g., Down's syndrome), and patients undergoing repeat surgeries/procedures, as well as younger children from one to four years of age.

It is important to know if parental presence during anesthetic induction for the young pediatric population confers measurable benefits, because a hospital-wide policy endorsing parental presence has important resource implications with respect to possible additional staffing requirements and a possible decrease in operating room efficiency. For those reasons, we undertook an evidence-based review of the current literature addressing this subject, in order to determine the overall effect of parental presence on the anxiety levels of both the parent and the child during anesthetic induction.

Methods

A search of MEDLINE (1950 to 2008) and EMBASE (1980 to 2008) was conducted. The following search string was used in MEDLINE: exp anesthesia/ and exp anxiety/ and exp parents/ and (exp child/ or exp infant/). In EMBASE the following search string was used: exp anesthesia/ and anxiety/ and exp parent/ and (exp child/ or exp newborn/). The searches were limited to studies using humans and those written in the English language. The results from both searches were exported to EndNote where duplicate results were removed. Relevant references mentioned in the reference lists of these results were also retrieved.

Studies had to meet the following inclusion criteria to be eligible: parental presence during anesthesia induction compared to another intervention or usual care, parents' and/or children's anxiety measured as an outcome, and sample size greater than one. Studies were excluded if they evaluated post-discharge anxiety rather than in-hospital anxiety.

The following information was extracted from each study: author, year, country, study design, sample, anxiety measures, intervention, comparison, and outcome. *P*-values and confidence intervals were also extracted from each study if they were supplied by the authors. When *P* values were not supplied by the authors, they were calculated if they could be generated from the published data.

Each study was assigned a level of evidence, i.e., from level I (stronger evidence) to level V (weaker evidence) based on the study's design.[1] For the purposes of this review, only level I–III evidence was considered. Level I comprised high quality randomized controlled trials (RCTs) and systematic reviews of level I studies with consistent results. Level II comprised lesser quality RCTs (i.e., no blinding or improper randomization), prospective comparative studies, and systematic reviews of level II studies or level I studies with inconsistent results. Level III encompassed case-control studies, retrospective comparative studies, and systematic reviews of level III studies.[1]

Results

A total of 14 studies, summarized in Table 1 and outlined in detail in the following three sections, met all of the inclusion/

Table 1 Evidence table for parental presence during anesthesia induction and parents' and children's anxiety

Author, year, country	Level of evidence	Study design	Sample	Measures of anxiety		Intervention	Comparison	Outcome[a,b,c]	
				Parents	Children			Parents' anxiety	Children's anxiety
Parents' anxiety									
Bevan et al.,[2] 1990, Canada	II	Prospective comparative study	Parents of children aged 2–10 years undergoing ENT, plastic, dental, eye, or urologic surgery ($n = 134$)	Visual analogue scale	n/a	Parental presence ($n = 67$)	No parental presence ($n = 67$)	–	n/a
Blesch and Fisher,[3] 1996, USA	II	RCT	Parents of children aged 10 years or less undergoing elective myringotomy with tube insertion, tonsillectomy and/or adenoidectomy ($n = 75$)	State Trait Anxiety Inventory Blood pressure Pulse rates	n/a	Parental presence ($n = 41$)	No parental presence ($n = 34$)	–	n/a
Palermo et al.,[4] 2000, USA	II	RCT	Parents of infants aged 1–12 months undergoing outpatient surgery ($n = 73$)	State Trait Anxiety Inventory	n/a	Parental presence ($n = 37$)	No parental presence ($n = 36$)	–	n/a
Children's anxiety									
Hickmott et al.,[5] 1989, UK	II	RCT	Children aged 1–9 years undergoing minor elective surgery ($n = 49$)	n/a	Observational measure using a predetermined scale ranging from 0 (no anxiety) to 2 (marked anxiety) during the waiting period and 0 (calm) to 4 (screaming and uncontrollable) during the induction period	Maternal presence ($n = 26$)	No maternal presence ($n = 23$)	n/a	–
Amanor-Boadu,[6] 2002, Nigeria	II	RCT	Children aged 1–12 years undergoing inguinal surgery as day cases ($n = 118$)	n/a	Heart rates	Parental presence ($n = 52$)	No parental presence ($n = 66$)	n/a	+

Table 1 continued

Author, year, country	Level of evidence	Study design	Sample	Measures of anxiety		Intervention	Comparison	Outcome[a,b,c]	
				Parents	Children			Parents' anxiety	Children's anxiety
Kain et al.,[7] 2006, USA	III	Retrospective comparative study	Children aged 2–12 years undergoing elective outpatient surgery ($n = 568$)	n/a	Modified Yale Preoperative Anxiety Scale	Parental presence ($n = 284$)	No parental presence ($n = 284$)	n/a	+, –
Patel et al.,[8] 2006, USA	II	RCT	Children aged 4–12 years undergoing outpatient surgery ($n = 112$)	n/a	Modified Yale Preoperative Anxiety Scale	Parental presence ($n = 36$)	Parental presence plus midazolam ($n = 38$)	n/a	–
							Parental presence plus a hand-held video game ($n = 38$)	n/a	*
Parents' and children's anxiety									
Johnston et al.,[9] 1988, Canada	II	Prospective comparative study	Parents and their children aged 2–8 years undergoing day surgery ($n = 134$)	Visual analogue scale	Global mood scale	Parental presence ($n = 67$)	No parental presence ($n = 67$)	+, –, *	–, *
Cameron et al.,[10] 1996, Australia	II	Prospective comparative study	Parents and their children aged 1–8 years undergoing day surgery ($n = 74$)	Visual analogue scale	Parent-report of children's anxiety using a five-point scale ranging from 1 (cheerful and attentive) to 5 (very distressed and uncontrollable)	Parental presence ($n = 38$)	No parental presence ($n = 36$)	+	+
Kain et al.,[11] 1996, USA	II	RCT	Parents and their children aged 1–6 years undergoing elective outpatient surgery ($n = 84$)	State Trait Anxiety Inventory Visual analogue scale Heart rates Blood pressure	Yale Preoperative Anxiety Scale Clinical Anxiety Rating Scale Visual analogue scale Cortisol	Parental presence ($n = 43$)	No parental presence ($n = 41$)	–	–

Table 1 continued

Author, year, country	Level of evidence	Study design	Sample	Measures of anxiety		Intervention	Comparison	Outcome[a,b,c]	
				Parents	Children			Parents' anxiety	Children's anxiety
Kain et al.,[12] 1998, USA	II	RCT	Parents and their children aged 2–8 years undergoing elective outpatient surgery ($n = 88$)	State Trait Anxiety Inventory	Procedural behaviour rating scale Modified Yale Preoperative Anxiety Scale	Parental presence ($n = 29$)	Premedication with oral midazolam mixed in acetaminophine syrup at least 20 min before surgery ($n = 33$)	*	–, *
							No parental presence and no sedative premedication ($n = 26$)	–	–
Kain et al.,[13] 2000, USA	II	RCT	Parents and their children aged 2–8 years undergoing elective outpatient surgery ($n = 103$)	State Trait Anxiety Inventory	Modified Yale Preoperative Anxiety Scale	Parental presence plus premedication with oral midazolam syrup at least 20 min before surgery	Premedication with oral midazolam syrup at least 20 min before surgery	+	–
Kain et al.,[14] 2003, USA	II	RCT	Parents and their children undergoing elective outpatient surgery ($n = 80$)	State Trait Anxiety Inventory Heart rates Skin conductance levels Blood pressure	Modified Yale Preoperative Anxiety Scale	Parental presence ($n = 29$)	Parental presence plus oral midazolam ($0.5\ \text{mg k}^{-1}$) about 30 min before induction ($n = 27$)	–	*
							No parental presence ($n = 24$)	–, *	–
Kain et al.,[15] 2003, USA	II	Prospective comparative study	Parents and their children who had previously undergone surgery and were undergoing subsequent surgery ($n = 83$)	State Trait Anxiety Inventory	Modified Yale Preoperative Anxiety Scale	Parental presence ($n = 46$)	Midazolam ($n = 8$)	+, –	+, –
							Parental presence plus midazolam ($n = 21$)	+, –	+, –
							No parental presence and no midazolam ($n = 8$)	–	–

n/a not applicable, *ENT* ear, nose, and throat, *RCT* randomized controlled trial

[a] + indicates intervention better than comparison

[b] – indicates no difference between intervention and comparison

[c] * indicates comparison better than intervention

exclusion criteria and formed the basis of this review. The years of publication ranged from 1988 to 2006. Of the 14 studies, three were related to parents' anxiety, four to children's anxiety, and seven to both parents' and children's anxiety. Nine of the 14 studies were RCTs (none was single- or double-blind), four were prospective comparative studies, and one was a retrospective comparative study. Of the 14 studies, none provided level I evidence, 13 provided level II evidence, and one provided level III evidence.

Parental presence and parents' anxiety

Three studies focused on parental presence during anesthesia induction in relation to parents' anxiety. One was a prospective comparative study and two were RCTs (all level II).

In a prospective comparative study, Bevan et al.[2] examined parents of children aged 2–10 years undergoing ear, nose and throat, plastic, dental, eye, or urologic surgery at the Day Surgery Centre of Montreal Children's Hospital. Of the 134 children enrolled in the study, 67 had parents present during induction (treatment group) and 67 did not (control group). Per usual practice, parents in the latter group were separated from their children at the operating room door. Group assignment was determined by day of surgery, whereby all children having surgery on specific days were accompanied by parents. To avoid bias and to ensure that all types of surgical patients were included in both groups, the days for parents to accompany children were rotated each consecutive week of the study. To avoid contamination, all parents were either present or not present on a given day to prevent intermingling between groups in the operating room area. Parents' in-hospital anxiety was assessed in the reception and induction areas with the visual analogue scale (VAS), a 100 mm linear scale on which parents drew a cross over the line representing their level of anxiety ranging from 0 to 100 ("no fear" to "great anxiety"). Parents in the treatment group had a mean VAS score of 42.8 ± 32.2 in the reception area compared to 41.9 ± 28.9 in the control group. In the induction area, the treatment group had a mean VAS score of 54.1 ± 36.4 compared to 52.3 ± 33.1 in the control group. Neither of these between-group differences were significant, but the *P*-values were not provided. The main limitation of this study was the lack of proper randomization.

Blesch and Fisher[3] carried out a RCT of parents of children aged 10 years or less undergoing elective myringotomy with tube insertion, tonsillectomy, and/or adenoidectomy at Union Hospital in Terre Haute, Indiana. Of the 75 parents in the study, 41 were present for induction (treatment group) and 34 were not (control group). Parents were randomly assigned to treatment and control groups based on the week that their children were scheduled for surgery. Consequently, in differing weeks, all parents were either present or not present. Parents' blood pressure and pulse rates were obtained as measures of anxiety at the following intervals: after consenting to the study (time one), after separation from children (time two), and before discharge (time three). The state portion of the State-Trait Anxiety Inventory (STAI) was also used as a measure of parents' anxiety. After consent, the treatment group's mean blood pressure was 115/76 ± 13.7/9.8 mmHg compared to 112/72 ± 13.4/8.8 mmHg in the control group. After consent, the treatment group's mean pulse rate was 77 ± 10.2/min compared to 73 ± 10.5/min in the control group. After separation from children, the treatment group's mean blood pressure and pulse rate were 132/78 ± 19/10.9 mmHg and 81 ± 12.7/min, respectively, compared to 125/80 ± 15.4/11.5 mmHg and 75 ± 14.9/min, respectively, in the control group. Before discharge, the treatment group's mean blood pressure was 118/73 ± 12.8/11 mmHg compared to 110/71 ± 9.2/7.9 mmHg in the control group. Before discharge, the treatment group's mean pulse rate was 73 ± 7.3/min compared to 74 ± 12.6/min in the control group. Of the *P*-values reported, the only significant differences found between the treatment and control groups were between time one and time two mean diastolic blood pressures (−2.49 ± 10.63 vs. −8.24 ± 11.01, respectively; $P = 0.025$) and time two and time three mean pulse rates (7.66 ± 10.30 vs. 2.00 ± 9.07, respectively; $P = 0.016$). Anxiety, as measured by mean STAI scores, was not significantly different between the treatment and control group (39.05 ± 11.53 vs. 44.61 ± 14.51, respectively; $P = 0.077$). This study lacked proper randomization and was insufficiently powered.

In a RCT by Palermo et al.,[4] parents of infants aged one to 12 months undergoing outpatient surgery were assessed. Of the 73 parents in the study, 37 were present during induction and 36 were not. Parental anxiety was measured with the STAI before and after surgery. There were no significant differences in anxiety between the two groups. Before surgery, parents of accompanied children had a mean STAI score of 57.6 ± 5.4 compared to 56.9 ± 6.4 for parents of unaccompanied children. After surgery, parents of accompanied children had a mean STAI score of 47.2 ± 4.8 compared to 45.2 ± 5.2 for parents of unaccompanied children. The *P*-values were not provided, the randomization process was not described, and the power of the study was low given the small sample size.

Parental presence and children's anxiety

Four studies examined parental presence during anesthesia induction in relation to children's anxiety. Three were

RCTs, and one was a retrospective comparative study (level II and level III, respectively).

Hickmott et al.[5] undertook a RCT of children aged 1–9 years undergoing minor elective surgery and general anesthesia classified as ASA grades I or II. Of 49 children in the study, 26 had their mothers present during induction and 23 did not. Random allocation to each group was determined by the week in which the children's surgery took place, whereby parents of children who were undergoing surgery were invited to accompany their children in the alternating weeks of the 8-week study. Parents were not invited to accompany their children in the other weeks. Though either the mother or the father was permitted to accompany the child, in all cases, it was the mother who chose to be present. A recovery room or ward nurse, not involved in the anesthetic procedure, was responsible for observing and measuring children's anxiety levels in the anesthesia room. Time in the anesthesia room was separated into the 'waiting period' (time from the children's arrival until the anesthesiologist arrived) and the 'induction period' (time from the anesthesiologist's arrival). Children's anxiety was measured using a pre-determined scale ranging from 0 (no anxiety) to 2 (marked anxiety) during the waiting period and 0 (calm) to 4 (screaming and uncontrollable) during the induction period. During the waiting period in the mother-present group, five children scored 0 and two children scored 2; whereas, in the mother-absent group, seven children scored 0 and one each scored 1 and 2. It should be noted that not all of the children experienced a waiting period. During the induction period in the mother-present group, 13 children scored 0, nine scored 1, and two each scored 2 and 3; whereas, in the mother-absent group, 15 children scored 0, four scored 1, three scored 2, and one scored 3. Children's anxiety levels did not differ significantly between the two groups during either the waiting or the induction period (Mann–Whitney *U* test). However, the *P*-values were not provided by the authors. This study had low power and inadequate randomization.

In a RCT, Amanor-Boadu[6] assessed 118 children aged 1–12 years undergoing inguinal surgery as day cases. Children undergoing surgery were randomly assigned to be accompanied or unaccompanied. The randomization process was not described. Of the 118 children in the study, 52 were accompanied by a parent and 66 were not. Children were evaluated according to their age group, i.e., aged 5 years or less and more than 5 years. As a measure of anxiety, clinically recorded heart rates using a stethoscope were taken both on the ward and before induction. For children 5 years or less, unaccompanied children had a mean heart rate of 109 $\pm$ 13/min on the ward compared to 111 $\pm$ 12/min for accompanied children. For children more than 5 years, unaccompanied children had a mean heart rate of 101 $\pm$ 11/min on the ward compared to 100 $\pm$ 10/min for accompanied children. These two differences were not significant, but the *P*-values were not provided by the author. As for mean heart rates before induction, for children 5 years or less, it was 128 $\pm$ 20/min for unaccompanied children compared to 118 $\pm$ 16/min for accompanied children. For children more than 5 years, it was 108 $\pm$ 10/min for unaccompanied children compared to 97 $\pm$ 19/min for accompanied children. Both of these differences were significant at $P = 0.001$.

In a retrospective comparative study using a multiple matched concurrent cohort, Kain et al.[7] assessed children aged 2–12 years classified as ASA physical status I or II undergoing elective outpatient surgery with general anesthesia. The authors examined children's anxiety in relation to parents'. The participants were selected from a database of children from a number of previous prospective and randomized studies that the authors conducted comparing parental presence with no parental presence. Of the 568 children included in the study, 284 had their parent present during induction and 284 did not. In the previous studies, the children were allocated either to receive parental presence or not to receive parental presence in the preoperative waiting area, but the group assignment process was not described. For children, anxiety was measured with the modified Yale Preoperative Anxiety Scale (mYPAS), an observational measure of children's preoperative anxiety. Children were categorized as "anxious" if they scored >40 on the mYPAS, and they were categorized as "calm" if they scored <30 on the mYPAS. For parents, anxiety was measured with the STAI, a self-report measure of state and trait anxiety. Parents were categorized as "anxious" if they scored in the upper 50% on the STAI, and they were categorized as "calm" if they scored in the lower 50% on the STAI. Four groups of child-parent pairs were then retrospectively compared for the parent-present and parent-absent groups: calm parent-calm child, anxious parent-calm child, calm parent-anxious child, and anxious parent-anxious child. Two significant differences were found. Anxious children with calm parents present were significantly less anxious during induction than anxious children with no calm parents present (mean mYPAS = 51.9 $\pm$ 24 vs. 64.6 $\pm$ 26, respectively; $P = 0.03$). Calm children with anxious parents present were significantly more anxious during induction than calm children with no anxious parents present (mean mYPAS = 52.4 $\pm$ 28 vs. 39.4 $\pm$ 21, respectively; $P = 0.002$). On the other hand, there was no significant difference in anxiety during induction between calm children with calm parents present and calm children with no calm parents present (mean mYPAS = 39.9 $\pm$ 22 vs. 34.7 $\pm$ 20, respectively; $P = 0.150$), and no significant difference in anxiety during induction between anxious children with anxious parents present and anxious children with no anxious parents present (mean mYPAS = 71.0 ± 23 vs. 66.6 ± 27, respectively; $P = 0.490$). This study had a large sample size; however it was retrospective and not randomized.

In a RCT, Patel et al.[8] examined 112 children aged 4–12 years undergoing outpatient surgery. Using the mYPAS, an observational measure containing 22 items in five categories (activity, emotional expressivity, state of arousal, vocalization, and use of parents) with scores ranging from 23 to 100, children's change in anxiety was assessed from baseline to introduction of the anesthesia mask. Children were randomly assigned to one of three groups using sealed envelopes: parental presence ($n = 36$), parental presence plus 0.5 mg kg^{-1} oral midazolam ($n = 38$), or parental presence plus a hand-held video game ($n = 38$). Children who received parental presence plus a hand-held video game experienced a statistically significant decrease in anxiety from baseline to introduction of the anesthesia mask compared to children who received parental presence alone (median change in mYPAS = −3.3 vs. +11.8, respectively; $P = 0.04$). Children who received parental presence plus midazolam did not experience a statistically significant change in anxiety from baseline to introduction of the anesthesia mask compared to the other two groups (median change in mYPAS = +7.3; *P*-value not provided). The sample size of this study was relatively small.

Parental presence and parents' and children's anxiety

Seven studies examined both parents' and children's anxiety in relation to parental presence during anesthesia induction. Three were prospective comparative studies and four were RCTs (all level II).

Johnston et al.[9] carried out a prospective comparative study of parents and their children aged 2–8 years undergoing day surgery. Of the 134 children in the study, 67 had their parent present and 67 did not. Parents and children were assigned to each group based on the day of the week that surgery was scheduled. The days were alternated each week of the study to ensure that all types of surgical patients were represented in both groups. It also ensured that, on a given day, all parents either accompanied or did not accompany children. Anxiety was measured before induction. For parents, the VAS, a 10 cm line ranging from 0 ("no anxiety") to 10 ("most anxiety") was used on which parents drew a cross through the point that indicated their anxiety. For children, the Global Mood Scale (GMS), an observation scale ranging from 1 (child attentive and happily active) to 7 (child screaming), was used. Overall, there were no differences in parents' or children's anxiety between parent-present and parent-absent groups. To conduct further analysis, the authors separated parents into low-anxiety and high-anxiety groups based on their VAS scores; i.e., those who scored ≤3 on the VAS were considered low-anxiety, and those who scored ≥6 on the VAS were considered high-anxiety. The authors found that high-anxiety parents who were present for induction were more anxious than high-anxiety parents who were not present for induction. Low-anxiety parents who were present for induction were less anxious than low-anxiety parents who were not present for induction. Children with high-anxiety parents who were present were more anxious than children with high-anxiety parents who were not present. Children with low-anxiety parents experienced the same level of anxiety whether they were in the parent-present or parent-absent group. The *P*-values and exact VAS and GMS scores were not reported by the authors, and this study was not randomized.

In a prospective comparative study during a 3-month study period, Cameron et al.[10] assessed 74 parents and their children aged 1–8 years undergoing day surgery at St. Andrew's Hospital in Australia. Parents were only allowed to be present for induction if the anesthesiologist carrying out the induction granted them permission based on the anesthesiologist's individual preference per usual practice at St. Andrew's Hospital. The treatment group consisted of 38 parents who were granted permission and decided to be present. The control group consisted of 36 parents who were either not permitted or decided not to be present. Both of these scenarios could introduce potential bias into the study. In the control group, 22 parents chose to separate from their children in the theatre holding bay area (located 25 m from the day surgery ward and 40 m from the operating theatre) and 14 parents chose to separate from their children in the day surgery ward (where the children had pre- and post-surgery beds until they were discharged for the day). Parents' anxiety was measured immediately upon separation from their children using a VAS with scores ranging from 1 ("no anxiety at all") to 10 ("most anxiety anyone could have"). A five-point scale with scores ranging from 1 (cheerful and attentive) to 5 (very distressed and uncontrollable) was used by parents to assess their children's anxiety right before separation from them. Parents in the treatment group were significantly less anxious, as measured by the VAS, than parents in the control group (mean = 3.4 ± 1.6 vs. 6.5 ± 2.2, respectively; $P < 0.001$). Parents who were present for induction reported their children to be significantly less anxious than parents who were not present for induction (mean = 1.9 ± 1.1 vs. 2.8 ± 1.1, respectively; $P < 0.001$). This trial was not randomized.

In another RCT, Kain et al.[11] examined parents and their children aged 1–6 years classified as ASA physical status I or II undergoing elective outpatient surgery and general anesthesia at Yale-New Haven Children's Hospital. Of the

84 children in the study, 43 had their parent present during induction (intervention group) and 41 did not (control group). They were randomized into each group using a random numbers table generated by a computer. For children, anxiety was measured with the Yale Preoperative Anxiety Scale (YPAS), Clinical Anxiety Rating Scale (CARS), VAS, and cortisol. For parents, anxiety was measured with the STAI, VAS, heart rates, and blood pressure. The YPAS was an observational measure of children's preoperative anxiety consisting of 27 items in five categories (activity, emotional expressivity, state of arousal, vocalization, and use of parents) with scores ranging from 0 to 100 (higher scores indicated higher anxiety). The CARS was administered by observers at separation into the operating room, with children's anxiety rated on a six-point scale ranging from 0 ("relaxed, smiling") to 5 ("out of contact with reality, general loud crying"). The STAI was a self-report measure that assessed parents' responses to 40 statements using a four-point scale. Total scores on each portion of the STAI (situational and baseline anxiety) could range from 20 to 80, with higher scores indicating higher levels of anxiety. The VAS, a 100-mm line ranging from 0 ("not anxious") to 100 ("extremely anxious"), was used as an observational measure for children and a self-report measure for parents. Using these measures, no significant differences were found between the two groups for either children's or parents' anxiety. For children, anxiety was reported as medians and 25–75% interquartile ranges for the holding area, induction 1 (entering the induction room), and/or induction 2 (introduction of anesthesia mask). On the VAS, children in the control group compared to those in the intervention group scored the following: holding area = 11 (0–28) vs. 6 (0–33), respectively; induction 1 = 38 (0–89) vs. 37 (0–82), respectively; and induction 2 = 43 (5–78) vs. 45 (8–86), respectively. On the YPAS, children in the control group compared to those in the intervention group scored the following: induction 1 = 34 (24–41) vs. 30 (25–41), respectively, and induction 2 = 38 (24–65) vs. 42 (30–62), respectively. On the CARS, children in the control group compared to those in the intervention group scored the following: induction 1 = 0 (0–1) vs. 0 (0–1), respectively, and induction 2 = 1 (0–4) vs. 1 (0–4), respectively. With respect to cortisol ($\mu g\ mL^{-1}$) for induction 2, the results for children in the control group compared to those in the intervention group were 73 (51–100) vs. 76 (48–91), respectively. For parents, anxiety was reported as means and standard deviations or as medians and 25–75% interquartile ranges for the holding area and/or post-induction (after parents left their children). State-Trait Anxiety Inventory scores for the control and intervention group parents were 46 ± 12 vs. 43 ± 12, respectively, post-induction. Visual analogue scale scores for the control group parents compared to the intervention group parents were 43 (20–58) vs. 38 (13–49), respectively, in the holding area and 49 (18–73) vs. 41 (5–66), respectively, post-induction. Systolic blood pressure (mmHg) for the control group parents compared to the intervention group parents was 114 ± 11 vs. 116 ± 17, respectively, in the holding area and 122 ± 12 vs. 121 ± 13, respectively, post-induction. Diastolic blood pressure (mmHg) for the control group parents compared to the intervention group parents was 71 ± 8 vs. 67 ± 10, respectively, in the holding area and 77 ± 9 vs. 75 ± 7, respectively, post-induction. Heart rates (beats min^{-1}) for the control group parents compared to the intervention group parents were 81 ± 9 vs. 78 ± 8, respectively, in the holding area and 85 ± 10 vs. 84 ± 8, respectively, post-induction. Although *P*-values were not reported by the authors and the power was low, the randomization in this study was appropriate.

In another RCT, Kain et al.[12] examined 88 parents and their children aged 2–8 years classified as ASA physical status I or II undergoing general anesthesia and elective outpatient surgery at Yale-New Haven Children's Hospital. The children were randomized into three groups according to a random numbers table. The first group received parental presence ($n = 29$). The second group received premedication with oral midazolam mixed in acetaminophine syrup at least 20 min before surgery ($n = 33$). The third (control) group received no parental presence and no sedative premedication ($n = 26$). Anxiety was measured for parents with the STAI, a self-report measure containing two 20-item subscales measuring trait (baseline) and state (situational) anxiety. Anxiety was measured for children with the Procedural Behavior Rating Scale (PBRS), an observational scale containing 20 behavioural categories (i.e., crying, stoic silence, emotional support), and the YPAS, an observational measure of children's anxiety containing 27 items in five categories (activity, emotional expressivity, state of arousal, vocalization, and use of parents). There were no significant differences between the three groups regarding children's anxiety in the preoperative holding area, but the PBRS scores and *P*-values were not reported. Upon separation from their parents, children in the midazolam group were significantly less anxious than children in the other two groups [PBRS = 0 (0–1) vs. 4 (0–5); $P = 0.02$]. Children in the midazolam group were also significantly less anxious than children in the other two groups at both entrance to the operating room ($P = 0.0171$) and introduction of the anesthesia mask ($P = 0.0176$), but the exact mYPAS scores were not provided. Parents in the midazolam group were significantly less anxious after separation than parents in the parental presence group and parents in the control group (mean STAI score = 43 ± 12 vs. 50 ± 10 vs. 47 ± 10, respectively; $P = 0.048$).

In a RCT, Kain et al.[13] assessed 103 parents and their children aged 2–8 years classified as ASA physical status I or II undergoing general anesthesia and elective outpatient surgery at Yale-New Haven Children's Hospital. Parents and their children were randomly assigned to each group using a random numbers table. The intervention group had parental presence and received premedication with oral midazolam syrup (0.5 mg kg^{-1}) at least 20 min before surgery. The control group received premedication with oral midazolam syrup (0.5 mg kg^{-1}) at least 20 min before surgery only. Anxiety was measured for children with the mYPAS, an observational measure containing 27 items in five categories (activity, emotional expressivity, state of arousal, vocalization, and use of parents). For parents, anxiety was measured with the STAI, a self-report measure containing two 20-item subscales measuring trait (baseline) and state (situational) anxiety. Children's anxiety was not significantly different between the two study groups ($P = 0.49$), but the children's exact mYPAS scores were not provided. Parents' anxiety, on the other hand, was significantly lower after separation for those who were present compared to those who were not present (mean = 43 ± 11 vs. 48 ± 12, respectively; $P = 0.037$).

Kain et al.[14] undertook a RCT of parents and their children classified as ASA physical status I or II undergoing general anesthesia and elective outpatient surgery at Yale-New Haven Children's Hospital. Of the 80 children in the study, 29 had their parent present, 27 had their parent present and received oral midazolam (0.5 mg kg^{-1}) about 30 min before induction, and 24 did not have their parent present (control group). They were randomly assigned to the three groups based on a random number table. For children, anxiety was measured with the mYPAS, an observational state anxiety measure containing 27 items in five categories (activity, emotional expressivity, state of arousal, vocalization, and use of parents). For parents, anxiety was measured with the STAI, a self-report measure consisting of two 20-item subscales measuring baseline and situational anxiety. Heart rates, skin conductance levels (SCL), and blood pressure levels were also used to measure parents' anxiety. In the course of time, children in parental presence plus midazolam group were less anxious than children in either the control group or the parental presence only group ($P = 0.023$), but the mYPAS scores were not provided. At different time points, parents in both parental presence groups had higher anxiety, as measured by heart rates, than the control group ($P < 0.05$). However, there was no significant difference in heart rates between the parental presence and parental presence plus midazolam groups. The heart rates were not provided. Skin conductance level was higher in the two parental presence groups than in the control group ($P < 0.05$). However, there was no significant difference in SCL between the two parental presence groups. The SCLs were not provided by the authors. There were no significant differences between the parental presence, parental presence plus midazolam, and control groups with regards to systolic blood pressure (123 ± 21 vs. 128 ± 16 vs. 126 ± 19, respectively; $P = 0.59$) and diastolic blood pressure (82 ± 14 vs. 85 ± 13 vs. 81 ± 15, respectively; $P = 0.88$) after induction. In addition, there were no significant differences in parents' self-reported anxiety, as measured by the STAI, between the three groups (STAI scores and *P*-values were not provided).

Kain et al.[15] undertook a prospective comparative study of parents and their children (mean age = 4.9 years) who were part of a previous investigation by the authors at their initial surgery and were undergoing a subsequent surgery at Yale-New Haven Children's Hospital. At their initial surgery, the children had been assigned to the following preoperative intervention as part of the authors' original investigation: parental presence ($n = 27$), oral midazolam ($n = 13$), parental presence plus oral midazolam ($n = 10$), and no intervention ($n = 33$). Specific inclusion criteria at the subsequent surgery were as follows: ASA physical status I or II; no chronic illness, prematurity, or developmental delay; and assignment by the authors to the preoperative intervention at the initial surgery. The authors allowed parents to choose their preoperative intervention group at the subsequent surgery. This may have introduced bias related to parents choosing their own group as well as bias related to parents' experience with their children's previous surgery. The parents of the 83 children in the study chose the following preoperative intervention at the subsequent surgery: parental presence ($n = 46$), oral midazolam ($n = 8$), parental presence plus oral midazolam ($n = 21$), and no intervention ($n = 8$). Anxiety was measured for children with the mYPAS (an observation measure) and for parents with the STAI (a 40-item self-report measure containing 20 items measuring state anxiety and 20 items measuring trait anxiety). There were no significant differences between the groups regarding children's anxiety upon entering the operating room [median mYPAS score (range): parental presence = 45.8 (22.9–91.7), oral midazolam = 54.2 (22.9–95.8), parental presence plus oral midazolam = 35.4 (22.9–100.0), and no intervention = 23.2 (22.9–45.8); $P = 0.31$] or during induction [median mYPAS score (range): parental presence = 45.8 (22.9–100.0), oral midazolam = 65.5 (22.9–95.8), parental presence plus oral midazolam = 34.2 (22.9–100.0), and no intervention = 24.5 (22.9–50.0); $P = 0.15$]. There was also no significant difference in parents' anxiety at separation (mean STAI score: parental presence = 42.8 ± 11.1, oral midazolam = 49 ± 6.5, parental presence plus oral midazolam = 43.3 ± 13.0, and no intervention = 37.8 ± 6.5; $P = 0.28$). Children in the midazolam group experienced significantly higher anxiety in the preoperative holding area than children in the other groups [median mYPAS score (range): parental presence = 23.3 (23.3–70.0), oral midazolam = 37.5 (23.3–68.8), parental presence plus oral midazolam = 45.8 (23.3–96.7), and no intervention = 23.3 (23.3–55.0); $P = 0.03$]. Parents of children in the midazolam group were also significantly more anxious than parents of children in the other groups in the preoperative holding area (mean STAI score: parental presence = 38.6 ± 9.1, oral midazolam = 47.3 ± 8.4, parental presence plus oral midazolam = 42.5 ± 12.2, and no intervention = 36.8 ± 5.1; $P = 0.09$). This was not a randomized trial.

Summary of parents' anxiety

Ten studies in all evaluated parents' anxiety.[2–4,9–15] Of these, nine compared parental presence (intervention) to no parental presence (comparison).[2–4,9–12,14,15] Six studies found no difference between the two.[2–4,11,12,15] One study found that parental presence fared better than no parental presence; however, it used parents' self-reports to measure anxiety, so bias (parents thinking that their presence made a difference when it might not have) may have been a problem in this study.[10] The remaining two studies found mixed results (sometimes parental presence fared better, sometimes no parental presence fared better, or sometimes there was no difference between the two).[9,14] These two studies used parents' self-reports amongst their measures of anxiety, so that aspect may have played a role in the varied findings.

Several studies examined parents' anxiety by comparing parental presence to the sedative premedication midazolam.[12–15] Two studies compared parental presence (intervention) to midazolam (comparison).[12,15] While both studies used parents' self-reports to measure anxiety, one study found mixed results (sometimes parental presence fared better or sometimes there was no difference between parental presence and midazolam).[15] The other study determined that midazolam fared better than parental presence.[12] Another study compared parental presence plus midazolam (intervention) to midazolam alone (comparison) and determined that parental presence plus midazolam fared better than midazolam alone; but again, this study was based on parents' self-reports to measure anxiety.[13] Two other studies compared parental presence alone (intervention) to parental presence plus midazolam (comparison).[14,15] While both studies used parents' self-reports amongst their measures of anxiety, one study found mixed results (sometimes parental presence fared better or sometimes there was no difference between parental presence and parental presence plus midazolam);[15] the other study found no difference between the two.[14]

Summary of children's anxiety

In all, 11 studies examined children's anxiety.[5–15] Nine compared parental presence (intervention) to no parental presence (comparison).[5–7,9–12,14,15] Five found no difference between parental presence and no parental presence.[5,11,12,14,15] Two determined that parental presence fared better than no parental presence.[6,10] However, one of these studies relied on parents' reports of children's anxiety, so the findings could have been biased.[10] The remaining two studies found mixed results (sometimes parental presence fared better, sometimes no parental presence fared better, or sometimes there was no difference between the two).[7,9]

One study compared parental presence alone (intervention) to parental presence plus a hand-held video game (comparison).[8] It determined that parental presence plus a hand-held video game fared better than parental presence alone. As an adjunct to this study, it would have been interesting to compare parental presence alone (intervention) to a hand-held video game alone (comparison), to determine if parental presence or the distraction of a video game actually lessens children's anxiety.

Several studies compared parental presence with the sedative premedication midazolam in relation to children's anxiety.[8,12–15] Of these, two compared parental presence (intervention) to midazolam (comparison) and found mixed results (sometimes parental presence fared better, sometimes midazolam fared better, or sometimes there was no difference between the two).[12,15] Another study compared parental presence plus midazolam (intervention) to midazolam alone (comparison) and found no difference between the two.[13] Three other studies compared parental presence alone (intervention) to parental presence plus midazolam (comparison).[8,14,15] One found no difference between the two.[8] One found mixed results (sometimes parental presence fared better or sometimes there was no difference between parental presence and parental presence plus midazolam).[15] The remaining study found that parental presence plus midazolam fared better than parental presence alone.[14]

Discussion

Although one would assume that parental presence would be beneficial, our review found otherwise. In many cases, parental presence may not make any measurable/objective difference for anxiety, and other factors may play a role. For example, sedative premedications, such as midazolam, may decrease children's anxiety, and, subsequently, parental presence may be of no added benefit to these children. In this review, midazolam appeared to be a suitable replacement for parental presence for children's anxiety, since most of the studies found no difference between the two, and, in a few cases, midazolam fared better. In studies where parental presence fared better than midazolam for parents' anxiety, parents' self-reports were used to measure anxiety. This aspect may be a biased representation of anxiety. Still, their perception is their reality.

A major difficultly with these studies was the evaluation of anxiety, since parents' reports of their own and their children's anxiety may be inaccurate, because they are likely to have an unrealistic perception of the effect of their presence on both themselves and their children. Specifically, some parents may perceive their presence as beneficial, even when objective measures show otherwise. For example, when the studies used objective measures such as cortisol or heart rates as surrogate measures of anxiety, there often were either no differences between parental presence and midazolam, or midazolam fared better. However, when the studies used subjective parent self-reports, parental presence often fared better compared to midazolam. This suggests that bias may have played a role.

Another major problem relates to the study samples. Two of the 14 studies used the same patients.[2,9] In another 6 of the 14 studies there was some overlap of patients.[7,11–15] Although these eight studies used different approaches to studying their patients, collectively, they could have impacted the results by skewing/biasing the results in a specific direction.

This review has several potential limitations. First, variations in the ways that the studies measured anxiety precluded entering the data into a meta-analysis. For example, staff observations, parent reports, pulse rates, standardized questionnaires, and study-specific questionnaires were all used to measure anxiety in the studies. Second, variations in the times that the studies measured anxiety also preclude a meta-analytic approach. For instance, anxiety was measured at various time points in the studies, including preoperatively, during induction, and following separation. Third, the quality of the studies poses a problem; though many of the studies were RCTs, none of them was, nor could they have been, double blind.

There are a number of areas that would be of interest for future research into parental presence. One topic that should be further explored is the relationship/interaction between the state of children's and parents' anxiety and its impact on the effectiveness of parental presence. Although this topic has been examined,[7] it warrants further evaluation, because parents who are anxious may make their children more anxious and vice versa. A future randomized trial, with sufficient power to evaluate each subgroup, should objectively and subjectively measure parents' and children's anxiety. Specifically, it should examine the following four possible pairings of children's and parents' state of anxiety (presented in order from least to most likely to benefit from parental presence): (1) anxious children-anxious parents; (2) calm children-calm parents; (3) calm children-anxious parents; and (4) anxious children-calm parents. In the first situation, anxious children would almost certainly not benefit from the presence of anxious parents, and the reverse is also true. This was examined in a recent study by Arai et al.,[16] in which higher parental anxiety pre-surgery, as indicated by higher amounts of maternal salivary amylase activity, was significantly correlated with higher children's anxiety during induction ($P < 0.0001$). In the second case, calm children would likely not need calm parents to be present and vice versa. In the third scenario, calm children may become more anxious from the presence of anxious parents, and anxious parents may become either more or less anxious from being present. The fourth combination is the most likely to benefit from parental presence, since calm parents may make anxious children less anxious. However, since anxious children may make calm parents more anxious, sedative premedications, such as midazolam, may be the best choice for calming anxious children without the risk of escalating calm parents' anxiety.

It would also be interesting to investigate whether or not parents' and children's anxiety can be mitigated by a preoperative preparation program, a scenario that various authors have explored.[17–20] A recent RCT[21] demonstrated that parents and children who underwent a family-centred preoperative preparation program had significantly lower anxiety in the holding area than those who received standard of care, parental presence, or midazolam. They were also less anxious during induction than those who received standard of care or parental presence, suggesting that a preoperative preparation program could be a suitable alternative, not only to parental presence, but also to midazolam. Due to the costs and effort involved with such a program, however, midazolam may still be the better option. Since a recent study[22] showed that midazolam may not be effective for younger or more emotional children, this would also need to be taken into consideration.

Other areas for research include examining parental presence or midazolam vs. distraction techniques, such as handheld video/audio devices. The presence of a child life worker, rather than a parent, should also be examined. Another area to research is the subset of children for whom parental presence appears to be beneficial (i.e., children with behavioural issues, developmental delay, or those undergoing repeat surgeries/procedures). For these particular groups of children, parental presence may be extremely helpful for the children, the parents, and the hospital staff. Finally, the relationship between children's age and induction-related separation anxiety should be further explored.

At our institution, we recognize the importance of family-centred care, and we acknowledge that families experience and manage perioperative anxiety differently. Our governing principle, however, is to put the best interests and safety of the child first. Currently, we are developing a guideline around parental presence. Based on our institutional experience and the findings from this review, we recommend the following:

1. Prior to the day of surgery, all parents should be informed about the different induction options available to them.
2. Prior to the day of surgery, parents who are eligible (based on pre-determined criteria regarding children's age, medical condition, procedure, emergent/elective case, etc.) and who express a desire to be present should be informed about the risks and benefits involved. In particular, it should be emphasized that there is unclear/inconclusive evidence regarding the benefit of parental presence and, in some cases, it may actually be harmful. Those parents who continue to express a desire to be present and for whom no contraindications exist (i.e., parents' health, state of anxiety, etc.) should receive preoperative training/ preparation so that they can be educated on what to expect and how to be helpful if they are permitted to be present during anesthetic induction.
3. On the day of surgery, parents may be present if all factors are amenable (i.e., adequate staffing, no change in children's health status, etc.) and if the parents are still deemed suitable to be present (i.e., parents not unduly anxious/aggressive, etc.). The final decision is always made by the attending anesthesiologist.

In conclusion, current evidence shows that, for the most part, parental presence does not seem to benefit parents' and children's anxiety. In many cases, midazolam or distraction techniques appear to be a suitable substitute. In the end, individual anesthesiologists must consider all of the factors and make a decision that is in the best interests, well-being, and safety of the child, which is of utmost importance. In Canada, there is no monetary benefit to the hospital/physician for offering parental presence as an incentive to attract patient business. Ultimately, what is best and safest for the child is the major deciding factor. Since family dynamics are important, however, the question remains, "Should we be treating parents as well, if the answer is yes, then how?"

Funding sources None.

Conflicts of interest None declared.

References

1. *Wright JG, Swiontkowski MF, Heckman JD*. Introducing levels of evidence to the journal. J Bone Joint Surg Am 2003; 85-A: 1–3.
2. *Bevan JC, Johnston C, Haig MJ, et al*. Preoperative parental anxiety predicts behavioural and emotional responses to induction of anaesthesia in children. Can J Anaesth 1990; 37: 177–82.
3. *Blesch P, Fisher ML*. The impact of parental presence on parental anxiety and satisfaction. AORN J 1996; 63: 761–8.
4. *Palermo TM, Tripi PA, Burgess E*. Parental presence during anaesthesia induction for outpatient surgery of the infant. Paediatr Anaesth 2000; 10: 487–91.
5. *Hickmott KC, Shaw EA, Goodyer I, Baker RD*. Anaesthetic induction in children: the effects of maternal presence on mood and subsequent behaviour. Eur J Anaesthesiol 1989; 6: 145–55.
6. *Amanor-Boadu SD*. The effect of parental presence at induction of anaesthesia on the behaviour of unsedated Nigerian children presenting for day-case anaesthesia. West Afr J Med 2002; 21: 28–30.
7. *Kain ZN, Caldwell-Andrews AA, Maranets I, Nelson W, Mayes LC*. Predicting which child-parent pair will benefit from parental presence during induction of anesthesia: a decision-making approach. Anesth Analg 2006; 102: 81–4.
8. *Patel A, Schieble T, Davidson M, et al*. Distraction with a hand-held video game reduces pediatric preoperative anxiety. Paediatr Anaesth 2006; 16: 1019–27.
9. *Johnston CC, Bevan JC, Haig MJ, Kirnon V, Tousignant G*. Parental presence during anesthesia induction. A research study. AORN J 1988; 47: 187–94.
10. *Cameron JA, Bond MJ, Pointer SC*. Reducing the anxiety of children undergoing surgery: parental presence during anaesthetic induction. J Paediatr Child Health 1996; 32: 51–6.
11. *Kain ZN, Mayes LC, Caramico LA, et al*. Parental presence during induction of anesthesia. A randomized controlled trial. Anesthesiology 1996; 84: 1060–7.
12. *Kain ZN, Mayes LC, Wang SM, Caramico LA, Hofstadter MB*. Parental presence during induction of anesthesia versus sedative premedication: which intervention is more effective? Anesthesiology 1998; 89: 1147–56.
13. *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: 939–46.
14. *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: 58–64.
15. *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: 970–5.
16. *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 Anaesthesiol Scand 2008; 52: 285–8.
17. *Ono S, Oikawa I, Hirabayashi Y, Manabe Y*. Preparation of a picture book to support parents and autonomy in preschool children facing day surgery. Pediatr Nurs 2008; 34: 82–3.
18. *Chan CS, Molassiotis A*. The effects of an educational programme on the anxiety and satisfaction level of parents having parent present induction and visitation in a postanaesthesia care unit. Paediatr Anaesth 2002; 12: 131–9.
19. *Rice M, Glasper A, Keeton D, Spargo P*. The effect of a preoperative education programme on perioperative anxiety in children: an observational study. Paediatr Anaesth 2008; 18: 426–30.

20. *Li HC, Lopez V*. Effectiveness and appropriateness of therapeutic play intervention in preparing children for surgery: a randomized controlled trial study. J Spec Pediatr Nurs 2008; 13: 63–73.
21. *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: 65–74.
22. *Kain ZN, MacLaren J, McClain BC, et al*. Effects of age and emotionality on the effectiveness of midazolam administered preoperatively to children. Anesthesiology 2007; 107: 545–52.