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Parental Presence during Induction of Anesthesia versus *Sedative Premedication*

Which Intervention Is More Effective?

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Background: **Both midazolam and parental presence during induction of anesthesia are routinely used to treat preoperative anxiety in children. The purpose of this investigation was to determine which of these two interventions is more effective.**

Methods: **Anxiety of the child during the perioperative period was the primary end point. Secondary end points included anxiety of the parent and compliance of the child during induction. Children (n = 88) were randomly assigned to one of three groups: (1) 0.5 mg/kg oral midazolam; (2) parental presence during induction of anesthesia; or (3) control (no parental presence or premedication). Using multiple behavioral measures of anxiety, the effect of the intervention on the children and their parents was assessed.**

Results: **Observed anxiety in the holding area (T_1), entrance to the operating room (T_2), and introduction of the anesthesia mask (T_3) differed significantly among the three groups (P = 0.032). *Post hoc* analysis indicated that children in the midazolam group exhibited significantly less anxiety compared with the children in the parental-presence group or control group (P = 0.0171). Similarly, parental anxiety scores after separation were significantly less in the midazolam group compared with the parental-presence or control groups (P = 0.048). The percentage of inductions in which compliance of the child was poor was significantly greater in the control group compared with the parental-presence and midazolam groups (25% *vs.* 17% *vs.* 0%, P = 0.013).**

Conclusions: **Under the conditions of this study, oral midazolam is more effective than either parental presence or no intervention for managing a child's and parent's anxiety during the preoperative period. (Key words: Children; parents; surgery.)**

This article is featured in "This Month in Anesthesiology." Please see this issue of ANESTHESIOLOGY, page 9A.

ANXIETY in young children undergoing anesthesia and surgery may be expressed in many forms.[1] Some children verbalize their fears, whereas for others anxiety is expressed only behaviorally. Many children look scared, become agitated, breathe deeply, tremble, stop talking or playing, and may start to cry. Others may unexpectedly urinate, have increased motor tone, and may actively attempt to escape from the medical personnel. These reactions reflect the child's fear of separation from parents and home environment, as well as of loss of control, unfamiliar routines, surgical instruments, and hospital procedures.[1,2] Kain *et al.*[3,4] have indicated, based on both behavioral and physiological responses, that induction of anesthesia appears to be the most stressful procedure the child experiences during the preoperative period.

Both behavioral interventions (*e.g.*, parental presence during induction of anesthesia) and pharmacologic interventions are available to treat preoperative anxiety in children.[5] Recent surveys have indicated that although some anesthesiologists strongly advocate the use of sedatives in children undergoing surgery,[6] others favor the use of parental presence during induction of anesthesia.[7] Furthermore, whereas previous studies have compared pharmacologic interventions with placebo[8,9] and behavioral interventions with controls,[4,10] no studies have directly contrasted a behavioral intervention to a pharmacologic intervention. The purpose of this investigation, therefore, was to determine which intervention

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was more effective for reducing the anxiety of children undergoing surgery: a pharmacologic intervention (midazolam) or a behavioral intervention (parental presence).

Materials and Methods

Study Design and Patients

In a randomized controlled trial, we compared parental presence with midazolam premedication and with a control group of children who received no medication and had no parent present. The study population consisted of 93 children ages 2–8 yr, who were classified as American Society of Anesthesiologists physical status 1 or 2 and undergoing general anesthesia and elective outpatient surgery at Yale-New Haven Children's Hospital. To avoid potential confounding variables, any history of chronic illness, prematurity, or developmental delay excluded subjects from participation in this study. In addition, parents who insisted on a particular study group were excluded *a priori* from this study. All inductions were performed by a group of six anesthesiologists. The protocol was approved by the institutional review board; all the parents provided written informed consent.

Study Interventions

Eligible patients were randomly assigned to one of three study groups according to a random numbers table:

1. Parental presence group: For children in this group, a parent went into the operating room with them and stayed through induction of anesthesia.
2. Midazolam group: Children in this group were premedicated with 0.5 mg/kg oral midazolam mixed in 10 mg/kg acetaminophine syrup at least 20 min before the procedure.
3. Control group: Children in this group went into the operating room without a parent or premedication.

The managing anesthesiologist, parents, and assessor did not know the randomization code, but it was impossible to be blind to assignment for children in the parental presence group.

Outcome Measures and Study Protocol

The primary end point was anxiety of the child during the perioperative period. Secondary end points included anxiety of the parent, compliance of the child, various recovery measures (*e.g.*, nausea and vomiting), and parental satisfaction.

Psychometric data regarding the behavioral assessment instruments are reported in detail in appendix 1. The following behavioral instruments were used in this study.

Coping and Temperament Measures

Monitor Blunter Style Scale. The Monitor Blunter Style Scale (MBSS), a standardized instrument, assesses coping style in adults through four scenarios of stressful situations.[11] The instrument was developed specifically for patients undergoing medical procedures and identifies information seeking, information avoiding, and distraction coping styles.

Coping Cards. This children's coping instrument asks the child to indicate whether nine different coping strategies are good or bad in a stressful situation.[12]

EASI Instrument of Child Temperament. This parental report instrument assesses four temperament categories, emotionality, activity, sociability, and impulsivity (EASI) in children and is widely used in the literature.[13]

Anxiety and Compliance Measures

State Trait Anxiety Inventory (STAI).‖ This self-reported anxiety instrument contains two separate 20-item subscales that measure trait (baseline) and state (situational) anxiety, and has been used in >1,000 studies published in peer reviewed literature.

Procedural Behavior Rating Scale. The Procedural Behavior Rating Scale (PBRS) is an observational scale used to assess children's behavior during various stressful medical procedures and contains 20 behavioral categories (*e.g.*, crying, stoic silence, emotional support, play).[14]

Modified Yale Preoperative Anxiety Scale. The Modified Yale Preoperative Anxiety Scale (mYPAS), an observational instrument of anxiety, contains 27 items in five categories indicating anxiety in young children (activity, emotional expressivity, state of arousal, vocalization, and use of parents).[15,16] The mYPAS has good to excellent reliability and validity for measuring children's anxiety in the preoperative holding area, when they enter the operating room, and during induction of anesthesia.

‖ Spielberger CD: Manual for the State-Trait Anxiety Inventory (STAI: Form Y). Palo Alto CA, Consulting Psychologists Press, 1983.

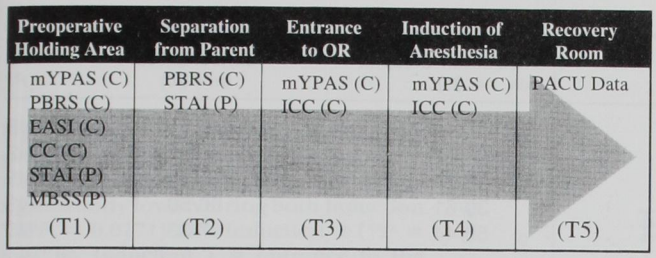

Fig. 1. Study timeline. mYPAS = Yale Preoperative Anxiety Scale; EASI = instrument of child temperament; CC = coping cards; STAI = State Trait Anxiety Inventory; MBSS = Monitor Blunter Style Scale; PBRS = procedural behavior rating scale; ICC = Induction Compliance Checklist; C = child; P = parent.

Induction Compliance Checklist. The Induction Compliance Checklist (ICC), an observational scale, was developed by our study group as a part of this investigation and is used to describe the compliance of a child during induction of anesthesia.

Behavioral Recovery Measures

Posthospitalization Behavior Questionnaire. The Posthospitalization Behavior Questionnaire is a widely used parental report tool to measure changes in children's behavior after surgery.[17,18]

Eight behavioral tools were used in this study; four were completed by the parent (MBSS, STAI, EASI, posthospitalization behavior questionnaire), three by an observer (mYPAS, PBRS, ICC), and one by the child (coping cards). A psychologist functioned as the assessor and administered the various observational tools.

Study Protocol

Participants were recruited 2–7 days before surgery while undergoing a behavioral preoperative preparation program (n = 48) or the night before surgery if they did not participate in the preparation program (n = 40). The program is voluntary and provides information to children and parents through an orientation tour of the operating room and postanesthesia care unit and modeling using dolls by child-life specialists. The modeling is tailored to the specific surgery planned for the child and is modified based on the age of the child. After recruitment, written consent and demographic data, including birth order, number of siblings, parental education, temperament (EASI) and coping style of the child (coping cards), and trait anxiety (STAI) and coping style of the parent (MBSS), were obtained (fig. 1).

Day of Surgery, Preoperative Holding Area. Anxiety of the child was measured by the assessor using the mYPAS and PBRS tools. Parents rated their own anxiety using the STAI. Next the participants were randomly assigned to one of the three groups. Parents in the parental-presence group were given detailed instructions about what to expect and how to interact with their child during the induction (appendix 2). This intervention was brief (2–5 min) and was based on clinical data that children are more calm when two sensory modalities (touch and sound) are engaged.[19] Parents were asked to talk, touch, and maintain eye contact with their children. Children in the midazolam group received the sedative 20 min before the expected surgery start time.

Day of Surgery, Separation. In the control and midazolam groups, both the child's (PBRS) and parent's (STAI) anxiety were assessed on separation to the operating room. In the parental-presence group, only one parent was allowed into the operating room. The child's response to separation from the parent who did not go into the operating room was assessed as well (PBRS) (fig. 1).

Day of Surgery, Operating Room. Anesthesia was induced using oxygen–nitrous oxide and halothane administered *via* a scented mask. The child's anxiety (mYPAS, PBRS) during induction was assessed at two time points: (1) entrance to the operating room and (2) introduction of the anesthesia mask. Compliance of the child during anesthetic induction was rated as well (ICC). As soon as anesthesia was induced, parents in the parental presence group were escorted to the waiting area and asked to rate their anxiety (STAI). Adverse effects, such as laryngospasm, were noted if they occurred, and duration of induction was recorded (fig. 1).

Day of Surgery, Recovery Room. The incidence of adverse effects, analgesic requirements, pain scores (as assessed by the Children's Hospital of Eastern Ontario Pain scale,[20] initial postoperative excitement (as assessed by the excitement scale),[21] time to first voiding, and amount of fluid intake were recorded. Time to discharge from the postanesthesia care unit and time to "postoperative recovery" (as assessed by Steward's Postoperative Recovery Scale)[22] were also recorded. Finally, parents were asked to rate their satisfaction with nursing, anesthesia, overall medical care, and the overall function of the surgical center. The ratings were done using a Likert scale, which ranged from "poor" (score of 0) to "very good" (score of 4) and were done separately for each discipline (such as nursing).

Two Weeks after Surgery. Parents were contacted over the telephone by a research nurse blind to group

Table 1. Characteristics of Study Subjects and Their Parents

	PPIA Group (n = 29)	Premedication Group (n = 33)	Control Group (n = 26)	*P*
Child's age (yr)	4.3 ± 1.8	4.0 ± 1.7	4.5 ± 1.5	NS
Parent's age (yr)	34 ± 6	32 ± 6	32 ± 4	NS
Child's gender (F/M) (%)	38/62	36/64	46/54	NS
Child's surgical history (% yes/% no)	46/54	39/61	50/50	NS
Preadmission program participation (% yes/% no)	47/53	56/44	67/33	NS
Child's temperament (EASI)				
Emotionality	10 ± 3	11 ± 4	10 ± 3	NS
Activity	17 ± 3	18 ± 3	15 ± 4	NS
Sociability	19 ± 2	18 ± 3	19 ± 3	NS
Impulsivity	13 ± 4	14 ± 4	12 ± 3	NS
Parent's temperament (STAI-T)	37 ± 7	37 ± 8	38 ± 8	NS
Parent's coping style (MBSS)				
Blunter score	3.5 ± 1.8	4.2 ± 2.2	3.9 ± 2.4	NS
Monitor score	8.8 ± 3.1	8.2 ± 3.1	8.7 ± 3.1	NS
Child's coping style (CC)	19.2 ± 5.8	17.0 ± 3.5	20.1 ± 3.7	NS

Data are mean ± SD.

EASI = Emotionality, Activity, Sociability and Impulsivity Instrument of Child Temperament; STAI-T = State Trait Anxiety Inventory, Trait Anxiety Subscore; MBSS = Monitor Blunter Style Scale; CC = Coping Cards; NS = not significant.

assignment, and the Posthospitalization Behavior Questionnaire was completed.

Statistical Analysis

Sample size was computed *a priori* for the three groups using analysis of variance estimates.# The primary end point was the anxiety of the child on introduction of the anesthesia mask as assessed by the mYPAS. Data obtained in a previous investigation indicated that the mYPAS score of the parental-presence group is expected to be about 54 ± 18 and the mYPAS score of the control group is expected to be about 50 ± 15.[4] Given a moderate to large size effect (for example, the anxiety of the midazolam group will be less by 35–40%, F = 0.35), a power of 80%, and an α statistic of 0.05 (two-tail), 30 participants would be needed in each of the three groups.

Descriptive statistics provide an overview of the relations between the child and parent variables and the anxiety level in the child and parent. Normally distributed data are presented as mean ± SD; skewed data are presented as median and interquartile ranges (25–75%). All analyses were performed on an intention-to-treat basis. Chi-squared tests and one-way analysis of variance were used to compare baseline demographic variables and parental anxiety. Two-way, repeated-measures analysis of variance and chi-squared test were used to assess child outcomes. If the data were skewed, the log transformation technique was used.

Borentein M, Cohen J. Statistical Power Analysis: A Computer Program (ANOVA Module). Mahwah, NJ, Lawrence Erlbaum Associates, 1988.

Results

Between June 1996 and December 1997, 93 patients were enrolled in this study. Five participants, however, were excluded because of violations in the anesthetic protocol (*i.e.*, use of sevoflurane rather than halothane). Therefore, 88 subjects were included in the final analysis. Table 1 shows baseline characteristics. The three groups were similar with regard to age, sex, temperament, coping styles, and parental trait anxiety.

Primary Outcomes

There were no differences in child's anxiety among the three groups in the preoperative holding area (PBRS, *P* = ns; fig. 2). On separation from parents, however, children in the midazolam group exhibited significantly less anxiety compared with the parental-presence and control groups (PBRS, 0 [0–1] *vs.* 4 [0–5], *P* = 0.02). Next we analyzed the changes in anxiety level along three time points: holding area (T_1), entrance to the operating room (T_3), and introduction of the anesthesia mask (T_4). Observed anxiety differed among the three groups (two-way repeated measures analysis of variance,

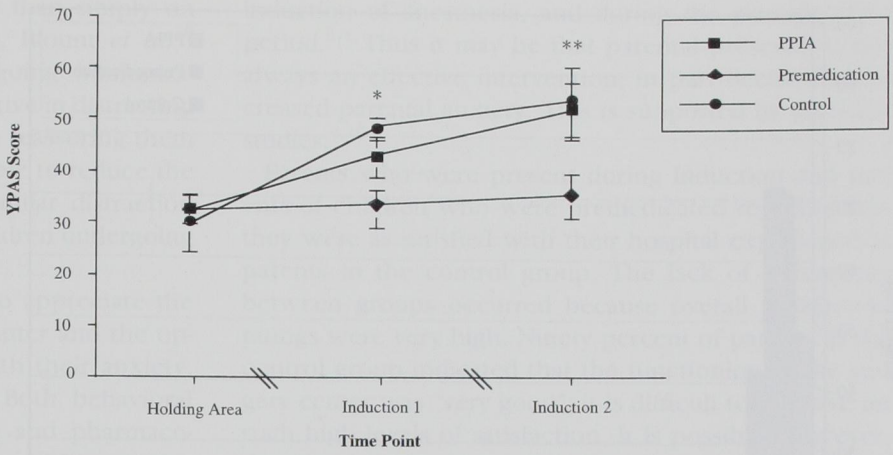

Fig. 2. Anxiety of the child during the perioperative period. As can be seen, anxiety of the premedication group was significantly lower during both induction 1 (*P = 0.0171) and induction 2 (P = 0.0176). Induction 1 = entrance to the operating room; induction 2 = introduction of the anesthesia mask to the child; mYPAS = Yale Preoperative Anxiety Scale.**

$F(2,78) = 3.58$, $P = 0.032$; fig. 2). In addition, there was a significant time × group interaction ($P = 0.008$). *Post hoc* analysis showed that the midazolam group was significantly less anxious compared with the parental-presence and control groups at both entrance to the operating room ($P = 0.0171$) and introduction of the anesthesia mask ($P = 0.0176$; fig. 2).

Secondary Outcomes

Children. As can be seen from figure 3, the percentage of inductions in which compliance of the child was poor (*i.e.*, ICC > 6) was significantly higher in the control group compared with the parental-presence and midazolam groups (25% *vs.* 17% *vs.* 0%, $P = 0.013$).

No anesthetic complications, such as laryngospasm, occurred during any of the inductions, and no parent demonstrated disruptive behavior or refused to leave the operating room. Although induction time was shorter in the midazolam group compared with the parental-presence and control groups, this was not significant (3.6 ± 0.3 min *vs.* 4.2 ± 0.6 min. *vs.* 5.9 ± 1.4 min, $P = 0.15$). In the postanesthesia care unit, the incidence of nausea or vomiting (19% *vs.* 15% *vs.* 23%, P = ns) and time to a score of 7 on Steward's Postoperative Recovery Scale (30 [15–45] min. *vs.* 35 [15–55] min. *vs.* 30 [15–40] min, P = ns) was similar for the parental presence, midazolam, and control groups. The postoperative excitement scores did not differ among the three groups (parental presence 1 [1–1.5] *vs.* midazolam 1 [1–2] *vs.* control 1 [1–2], P = ns). There were also no significant differences in the incidence of reported negative behavioral changes 2 weeks after surgery (41% *vs.* 46% *vs.* 43%, P = ns).

Parents. Anxiety of parents in the control and midazolam groups was assessed by the STAI after separation to the operating room occurred. Anxiety of parents in the parental-presence group was assessed immediately after the parent left the operating room and induction. Parents in the midazolam group were significantly less anxious after separation compared with the control group, and the parental-presence group (43 ± 12 *vs.* 47 ± 10 *vs.* 50 ± 10, $P = 0.048$; fig. 4).

An overwhelming majority of parents in all groups evaluated the anesthesiologist as "very good" (midazolam 100% *vs.* parental presence 90% *vs.* control 90%). Similarly, most parents evaluated nursing care (midazolam 100% *vs.* parental presence 100% *vs.* control 90%), overall medical care (midazolam 100% *vs.* parental presence 96% *vs.* control 90%), and the overall function of the pediatric surgery center (midazolam 100% *vs.* parental presence 87% *vs.* control 90%) as "very good" (P = ns).

Discussion

This study was done to assess the efficacy of parental presence compared with oral midazolam in young children undergoing anesthesia and surgery. Under the conditions of a randomized controlled trial, oral midazolam before surgery is a more effective intervention than either parental presence or control for managing a child's and parent's perioperative anxiety. In addition, premedicated children were more compliant during induction of anesthesia.

It is well established that most parents and children prefer to stay together during procedures such as immunization, dental procedures, bone marrow aspiration, and induction of anesthesia.[23–25] A growing body of literature, however, suggests that in the setting of a randomized controlled trial, parental presence may not

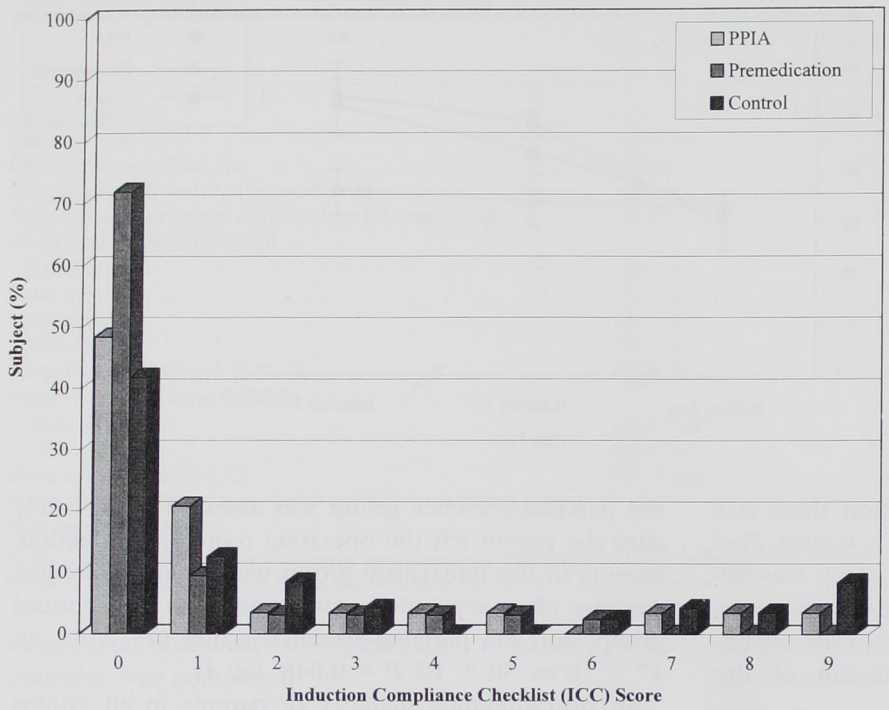

Fig. 3. Child's compliance during induction. ICC = Induction Compliance Checklist.

be an effective intervention to treat the anxiety of a child.[4,10,26] These findings may be related to two issues. First, the design of a randomized controlled trial may not reflect the practice of all anesthesiologists. That is, although a randomized controlled trial is applicable to centers that offer parental presence to all families, it may not be applicable to centers that consider each request for parental presence based on the personality characteristics of each child and parent. Such centers may have different results with parental presence than were demonstrated in this trial. Second, allowing a parent into an operating room without significant preparation may be counterproductive. Some parental behaviors, such as criticism, excessive reassurance, and commands, are associated with greater distress.[27] We believe research in this area should concentrate on what parents actually do

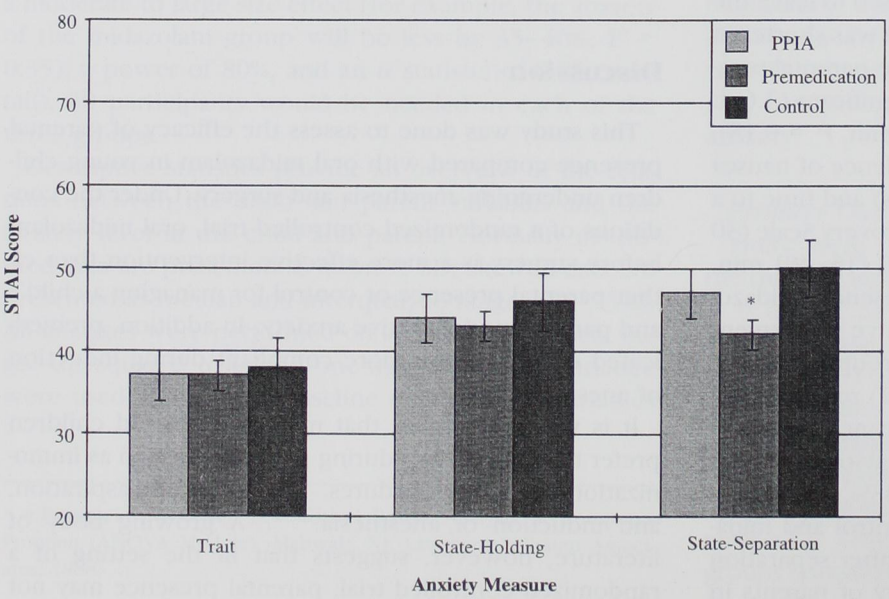

Fig. 4. Parental baseline anxiety (trait) contrasted with anxiety in the preoperative holding area and after separation from the child. *P = 0.048. STAI = State Trait Anxiety Inventory.

during induction of anesthesia, rather than simply on their presence in the operating room. Blount *et al.*[28] reported that among children undergoing immunizations, parents who were taught to be active in distracting through conversation and reading or in reassuring them through touch and eye contact were able to reduce the children's distress. We believe that similar distraction techniques can be implemented for children undergoing induction of general anesthesia.

Preschool children are old enough to appreciate the unfamiliar environment of a surgery center and the operating room. Their ability to cope with their anxiety, however, is still very much limited. Both behavioral interventions (*e.g.*, parental presence) and pharmacologic interventions (*e.g.*, sedatives) are available to treat preoperative anxiety in children.[5] Large-scale surveys, however, indicate that neither intervention is used widely.[6,7] For example, only 25% of all children younger than 3 yr are routinely premedicated in the United States.[6] Similarly, data obtained previously indicate that most anesthesiologists (59%) never have parents present during induction, 23% of anesthesiologists have parents present in $< 25\%$ of cases, and 10% of anesthesiologists have parents present in $> 75\%$ of cases.[6] These data correspond with an earlier survey that indicated that more than half of US anesthesiologists allow parental presence in $<5\%$ of their cases.[29] The low frequency with which premedication or parental presence are used in the United States is a concern given the adverse outcomes that are associated with high levels of preoperative anxiety in children. Preoperative anxiety may prolong the induction of anesthesia and lead to negative postoperative psychological effects, such as nightmares, eating disturbances, and new-onset enuresis.[3,30] Furthermore, use of oral midazolam before operation was recently reported to decrease the incidence of these negative postoperative psychological effects.[31] We found that among the three groups in this study, parents in the midazolam group were the least anxious after separation, and parents in the parental-presence group were the most anxious. Vessey *et al.*[32] recently evaluated parental anxiety associated with parental presence. These investigators followed parents of children undergoing surgery and reported that the most upsetting factors for parents were separation from the child after induction of anesthesia, watching the child go limp during induction, and seeing the child upset before induction.[32] We previously showed that increased perioperative parental anxiety is associated with increased anxiety of the child in the preoperative holding area, during induction of anesthesia, and during the postoperative period.[3,4] Thus it may be that parental presence is not always an effective intervention, in part because of increased parental anxiety. This is supported by previous studies.[4,10]

Parents who were present during induction and parents of children who were premedicated reported that they were as satisfied with their hospital experience as parents in the control group. The lack of differences between groups occurred because overall satisfaction ratings were very high. Ninety percent of parents in the control group indicated that the functioning of the surgery center was "very good"; it is difficult to improve on such high levels of satisfaction. It is possible, however, that the "satisfaction" assessment instrument we used was not sensitive enough to capture differences in parental satisfaction. More sophisticated satisfaction instruments may be needed.

Several design issues related to this study should be noted. First, an investigation involving parental presence conducted by our study group was criticized for various methodologic issues.[4] Previously we used a single individual anesthesiologist to administer all anesthetics, and all children underwent a preoperative preparation program. This limited our ability to apply our results to general practice ("external validity"). In addition, it was suggested that a preoperative preparation program combined with a caring anesthesiologist might minimize preoperative anxiety sufficiently to obviate the benefits of parental involvement. In the current investigation, we used a group of six anesthesiologists, and not all children underwent a preoperative preparation program. That is, we prevented some of the selection bias in the current study by recruiting participants not only during the preoperative preparation program but also on the telephone the night before surgery. On analysis of outcome data, we found no differences between the subgroups who participated and those who did not participate in the preoperative preparation program.

Second, in the current investigation, anxiety of the child (mYPAS) was measured by an assessor during the induction, but previously we videotaped the inductions and scored them at a later date. This is important because it has been suggested that videotaping during induction may distract the children and bias the results. We believe that the presence of an observer who is dressed in scrubs in the operating room is less distracting to the child than a video camera.

Third, both the child's and parent's anxiety were assessed using validated behavioral assessment tools.‖[15,16] The child's anxiety in the holding area and during induction of anesthesia was assessed using a structured observational anxiety scale (mYPAS). This scale was developed especially for this line of investigations, was validated in two separate studies,[15,16] and has good validity and inter- and intrarater reliability. Parental anxiety was assessed using Spielberger's STAI.‖ To date, this scale has been used in >1,000 studies published in the peer-reviewed literature.‖ In fact, it is considered the "gold standard" to evaluate anxiety in adults.[33]

Finally, ideally all assessors should be blinded and unaware of the presence or absence of the parent. Based on our experience, surrogates could not be used because the child's behavior to the surrogate indicated to the assessor the presence or absence of the parent. Thus, although the assessors were blinded to the midazolam *vs.* control groups, they were not blinded to the parental-presence group.

In conclusion, in this investigation we found that premedication with oral midazolam before surgery was a more effective intervention than either parental presence or no premedication–no parent present for managing a child's and parent's anxiety during the preoperative period. We also found that premedicated children were more compliant during induction of anesthesia. We suggest that in contrast to premedication with oral midazolam, parental presence is not an effective intervention for all children and the individual child, parent, and anesthesiologist must be considered.

Appendix 1

Temperament

EASI Instrument of Child Temperament

This is a standardized tool that assess the various aspects of temperament in children and is used widely in the literature.[13] This instrument includes 20 items in four behavioral categories: emotionality, activity, sociability, and impulsivity. A parent is presented with individual patterns of behaviors and responses to daily events and is asked to rate the child on a five-point scale. A score ranges from 5 to 25 for each category, with higher scores indicating higher baseline values of emotionality, activity, sociability, or impulsivity. The instrument has good validity when compared with other measures of temperament for preschool children. Test-retest reliability of the EASI temperament tool was high when mothers rated their preschool children on adjacent months.

Anxiety Modulation

Yale Preoperative Anxiety Scale

The Yale Preoperative Anxiety Scale (mYPAS), an observational measure of preoperative anxiety, was developed and validated in an investigation involving 58 children.[15,16] The mYPAS consists of 27 items in five categories of behavior indicating anxiety in young children (activity, emotional expressivity, state of arousal, vocalization, and use of parents). Using kappa statistics, all mYPAS categories have been demonstrated to have good to excellent inter- and intraobserver reliability (0.73–0.91), and when validated against other global behavioral measures of anxiety, the mYPAS had good validity (r = 0.64). The "adjusted mYPAS total score" ranges from 0 to 100, with higher scores indicating greater anxiety.

State Trait Anxiety Inventory‖

The State Trait Anxiety Inventory (STAI) is a widely used self-report anxiety assessment instrument. To date, more than 1,000 studies involving research using the STAI have been published in the peer-reviewed literature. The questionnaire contains two separate 20-item, self-report rating scales for measuring trait and state anxiety. Parents respond on a four-point scale. Total scores for situational and baseline questions separately range from 20 to 80, with higher scores denoting higher levels of anxiety. Test–retest correlations for the STAI are high, ranging from 0.73 to 0.86. Validity of the instrument was examined in two studies in which the STAI was given under high- and low-stress conditions to large samples of students. The r value ranged from 0.83 to 0.94, suggesting very good validity.

Procedural Behavior Rating Scale

The Procedural Behavior Rating Scale (PBRS) is an observational scale that was originally developed to evaluate distress in children undergoing bone marrow biopsy.[14] Since its original publication, the PBRS has also been used to describe children's behavior during various stressful medical procedures. Twenty behavioral categories (*e.g.*, crying, stoic silence, emotional support, play) are scored on a 0- to 3-point scale, where 0 = behavior did not occur, and 3 = behavior was extreme or lasted a specified amount of time. Total scores range from 0 to 60, with lower scores indicating fewer demonstrated behaviors. The measure has very good reliability and validity.

Compliance

Induction Compliance Checklist

The Induction Compliance Checklist (ICC) was developed by our study group as a part of this investigation and is used to describe the compliance of a child during induction of anesthesia (see table 2). A research team composed of one anesthesiologist and one psychologist examined videotapes of children undergoing induction of anesthesia (n = 48). During multiple group sessions, a checklist containing 11 items indicating compliance was developed. Next videotapes of a group of 36 children ages 1–9 yr undergoing mask induction of general anesthesia were analyzed separately and independently by two observers. Reliability between and within the two observers was assessed using interclass *r* analysis. Calculations were performed using the

Table 2. Induction Compliance Checklist*

Checklist	Score
Perfect induction (does not exhibit negative behaviors, fear or anxiety)	
Crying, tears in eyes	
Turns head away from mask	
Verbal refusal, says "no"	
Verbalization indicating fear or worry, "where's mommy?" or "will it hurt?"	
Pushes mask away with hands, pushes nurse/anesthetist with hands/feet	
Covers mouth/nose with hands/arms or buries face	
Hysterical crying, may scream	
Kicks/flails legs/arms, arches back, and/or general struggling	
Requires physical restraint	
Complete passivity, either rigid or limp	
Total score	

Total score = the number of categories checked (perfect score = 0).

* Check all behaviors observed.

computer program BIGRI**; this program also assigns the appropriate clinical significance to individual interclass r values: r values <0.40 = POOR; 0.40 to 0.59 = FAIR; 0.60 to 0.74 = GOOD; and 0.75 to 1.00 = EXCELLENT.[34] For our sample, interclass r values for observer 1 was 0.998 (F [35,1] = 1503.98, P = 0.01) and for observer 2 it was 0.995 (F [35,1] = 507.91, P = 0.01). Interclass r values between the two observers was high as well 0.978 (F [35,1] = 90.05, P = 0.01). The ICC score is the sum of the items checked. A perfect induction (in which the child does not exhibit negative behaviors, fear, or anxiety) is scored as 0.

Coping Style

Monitor Blunting Style Scale

The Monitor Blunting Style Scale, a standardized tool, was developed for patients undergoing medical procedures and identifies information seeking (high monitor)/information avoiders (low monitors) and distracters (high blunters)/nondistracters (low blunters).[11] The MBSS assesses coping style through four scenarios of stressful situations (for example, you are on an airplane that is experiencing severe turbulence). A list of eight possible reactions to the situation are presented, and the participant is asked to check each behavior in which they would engage in that situation (*i.e.*, look for exits or watch the in-flight movie). Four of the reactions are of a monitoring or information-seeking variety, and four are of a blunting or information-avoiding variety. This measure has excellent reliability and validity.

** Cicchetti DV, Aivano SL, Vitale J: Computer program for assessing the reliability and systematic bias of individual measurements. Version 2.15, 1996.

Coping Cards

This children's coping tool asks the child to indicate whether nine different coping strategies are good or bad in a stressful situation.[12] Children are told the story of John or Jill who is anxious because he or she must have a tooth pulled at the dentist. The children are given different behaviors (*i.e.*, think about something else, run away, talk to mom) that John or Jill can engage in and are asked to indicate if the behavior is a good or bad thing to do in this situation. They are then asked to rank the behavior as a little, some, or very good or bad. This measure has good reliability and validity.

Postoperative Behavior

Posthospitalization Behavior Questionnaire

This self-report questionnaire for parents is used widely in the literature and is designed to evaluate maladaptive behavioral responses and "developmental regression" in children after surgery.[17,18] The Posthospitalization Behavior Questionnaire consists of 27 items frequently cited in the literature as common behavioral responses of children after surgery. Six categories of anxiety are incorporated in this instrument, including general anxiety, separation anxiety, sleep anxiety, eating disturbances, aggression against authority, and apathy and withdrawal. For each item, parents rated the extent to which each behavior changed in frequency compared with before surgery. This instrument shows acceptable test–retest reliability, good agreement with psychiatric interviews with parents, and predicts changes as a function of preoperative interventions.

Appendix 2: Group Instructions to Parents

The following script records the instructions given to parents.

I am going to give you some instructions to help you and your child relax and to tell you what to expect as your child goes to sleep. If you do not understand them, just stop me and I will explain them again.

You are going to be present while your child undergoes anesthesia, goes to sleep. I know that you can help [child's name] during this procedure and help the doctors and nurses in the operating room.

We want you to stand next to your child in the operating room or sit with [child's name] on your lap. Please talk to [child's name], say what you usually say to [child's name] to comfort him or her. Perhaps you can sing or count with [child's name]. It is also helpful if you touch him or her on the face or hold hands. [Child's name] will want to hear your voice, see you, and feel that you are with him or her.

[Child's name] may cry, but that is all right. Sometimes children cry to release some of their tension. It is not your fault if your child cries, and you should keep talking and touch him or her. The operating room staff will not think poorly of you or your child if there are tears.

It can be a little scary for parents to watch their child undergoing anesthesia. They do not look like they do when they are asleep in bed, but don't worry, this is normal. [Child's name] may even move around, kick his or her legs or arms, or seem to be agitated while being induced. Again, this is completely normal. Once your child is asleep, you will be escorted back to the waiting area. [Child's name] is in good hands.

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