Changing Healthcare Providers' Behavior during Pediatric Inductions with an Empirically Based Intervention

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ABSTRACT

Background: Each year more than 4 million children experience significant levels of preoperative anxiety, which has been linked to poor recovery outcomes. Healthcare providers (HCPs) and parents represent key resources for children to help them manage their preoperative anxiety. The current study reports on the development and preliminary feasibility testing of a new intervention designed to change HCP and parent perioperative behaviors that have been reported previously to be associated with children's coping and stress behaviors before surgery.

Methods: An empirically derived intervention, Provider-Tailored Intervention for Perioperative Stress, was developed to train HCPs to increase behaviors that promote children's coping and decrease behaviors that may exacerbate children's distress. Rates of HCP behaviors were coded and compared between preintervention and postintervention. In addition, rates of parents' behaviors were compared between those that interacted with HCPs before training to those interacting with HCPs after the intervention.

Results: Effect sizes indicated that HCPs who underwent training demonstrated increases in rates of desired behaviors (range: 0.22–1.49) and decreases in rates of undesired behaviors (range: 0.15–2.15). In addition, parents, who were indirectly trained, also demonstrated changes to their rates of desired (range: 0.30–0.60) and undesired behaviors (range: 0.16–0.61).

Conclusions: The intervention successfully modified HCP and parent behaviors. It represents a potentially new clinical way to decrease anxiety in children. A multisite randomized control trial funded by the National Institute of Child Health and Development will examine the efficacy of this intervention in reducing children's preoperative anxiety and improving children's postoperative recovery.

What We Already Know about This Topic

- Healthcare providers are open to behavioral change to reduce stress and anxiety in children undergoing surgery, but their behaviors are not readily modified

What This Article Tells Us That Is New

- In a pilot study, multimodal training of physicians and nurses significantly increased desired behaviors, reduced undesired behaviors, and reduced levels of stress and anxiety in children undergoing surgery

EACH year approximately 4 million children in the United States experience a significant level of preoperative anxiety and distress.[1–3] High preoperative anxiety can have adverse physical and psychologic ramifications during and beyond the hospital stay, including a greater likelihood of emergence delirium, increased postoperative pain, and

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maladaptive postoperative behavioral changes.[4–6] Conversely, reduced anxiety in children is related to decreased need for postoperative analgesics, faster discharge from the recovery unit, and lower rates of maladaptive behavioral changes.[7]

Sedatives traditionally have been used to alleviate anxiety in children before surgery. However, the use of sedatives has been linked to increased emergence delirium, potential longer stay in the postanesthesia care unit, and increased operational costs.[8–10] As an alternative to sedatives, many anesthesiologists allow parents to be present during induction of anesthesia (PPIA). Unfortunately, results have been equivocal as to the effectiveness of parental presence during induction of anesthesia in reducing children's preoperative anxiety.[11–15] Because of this, the search continues for a cost-effective intervention aimed at reducing children's anxiety before surgery.[16]

Studies conducted in the area of pediatric invasive medical procedures have shown repeatedly that distraction, nonprocedure-related talk, and humor, as used by parents and medical staffs, are related to lower levels of distress.[17–20] Conversely, when adults use reassuring comments, apologies, criticism, empathic comments, or give the child too much control over the medical procedure, children exhibit higher levels of distress.[17,21,22] These two clusters of adult behaviors have opposite effects on children's anxiety, and are called *coping promoting* and *distress promoting* behaviors.[23]

Recent research by our laboratory that was conducted in the perioperative environment supported the findings of the aforementioned investigations on the influence of adult behaviors on children's distress and the temporal nature of these interactions.[24,25] Consistent with other invasive procedures, distracting talk by adults was related to more coping from children, and adult reassurance was related to more distress. A behavior not previously described in invasive procedures, medical reinterpretation (*i.e.*, reframing medical equipment and procedures as nonthreatening) showed interesting temporal differences. This behavior was a coping promoting behavior when it was used to reference equipment and procedures within children's immediate environment (*i.e.*, those that they could currently see, touch, and smell). Conversely, when used to reference objects that were not in the child's immediate environment (*i.e.*, reinterpreting the mask when the child was in the holding area) the behavior led to increased distress.[24] These relationships between adult behaviors and children's distress and coping indicate that adults can influence children's preoperative anxiety. As such, we submit that changing the behaviors of healthcare providers (HCPs) and parents represents an alternative way to manage children's perioperative anxiety. The next step in this line of investigations was to develop an intervention that targets the behaviors of HCPs and parents. The Provider-Tailored Intervention for Perioperative Stress (P-TIPS) is based on the findings from our previous research described above.[24–27]

Despite the promise of affecting children's anxiety *via* adult behavior, previous studies examining the malleability of HCP behavior have indicated that although HCPs are open to behavior change, their behaviors are not readily modified.[28–32] Thus, the purpose of this report was to outline the development of P-TIPS and describe a pilot study examining the ability of this intervention to change behaviors of HCPs and parents in the perioperative environment. Once we have demonstrated that this intervention is capable of changing the behavior of HCPs and parents, we plan to proceed with a multicenter, randomized controlled trial funded by the National Institutes of Health (2R01HD048935-06) to demonstrate the efficacy of the intervention in decreasing the anxiety and distress of children undergoing surgery and its potential impact on postoperative outcomes such as analgesic requirements and discharge time from the postanesthesia care unit.

Materials and Methods

The Institutional Review Boards at both participating sites (University of California, Irvine, Irvine, California and University of California, Los Angeles, Los Angeles, California) have approved all research procedures. Written informed consent was obtained from all parents and HCPs, and verbal assent was obtained from the children.

Intervention Development

The Provider-Tailored Intervention for Perioperative Stress represents the synthesis of a 5-yr study funded by the National Institutes of Health (5R01HD048935) examining HCP-child and parent-child interactions in the perioperative setting. It was developed in three phases. First, a compilation of target HCP and parent behaviors was defined. Second, our laboratory conducted several planning meetings with a team of experts in the field. Finally, the proposed intervention was tested in a multisite pilot study, the results of which are the presented in the current report.

Identification of Target Behaviors. Target behaviors for the intervention were identified based on findings from the aforementioned National Institutes of Health-funded study.[24–26] Briefly, over a period of 4 yr approximately 300 dyads of parent-child and HCPs were videotaped in perioperative settings. Cutting-edge statistical methods, such as sequential analysis, were used to identify a subset of adult behaviors that were related to children's coping (*i.e.*, desired behaviors) and children's distress (*i.e.*, undesired behaviors). In addition to support from these analyses, behaviors selected were reviewed by the multidisciplinary team for face validity. For details, we refer the reader to previous publications.[24–26]

Desirable adult behaviors included nonprocedural talk (*e.g.*, talk about friends, toys, movies, favorite games), humor, medical reinterpretation (*i.e.*, reframing medical procedures and equipment as something fun and positive), and providing developmentally appropriate procedural information.[17,24,33] These behaviors serve to distract children from

their emotions and/or help to reframe a new, potentially frightening environment to something that is manageable and understandable such that it is related to lower anxiety levels and increased coping behavior by children. Undesirable behaviors included reassuring statements, empathizing, and apologizing. These behaviors focus children on their emotions and may increase distress.[17,24,33] Implying control over situations that the child did not actually control was also identified as undesirable (*e.g.*, "Are you ready to go?" "Do you want to put this mask on?"). Giving a child implied control over a situation he or she has no actual control over undermines the child's sense of efficacy. These undesirable behaviors have been associated with higher levels of distress. Appendix 1 lists the desirable and undesirable behaviors.

Task Force Meetings. To ensure the effectiveness and clinical feasibility of this intervention, several planning meetings were conducted with a team of collaborators, including a pediatric anesthesiologist, pediatric psychologists, a clinical methodologist, a biostatistician, and research associates. The task force reviewed the desired and undesired behaviors that were identified in the previous study and developed an intervention for the implementation of these behaviors. The intervention was also presented to other pediatric anesthesiologists, pediatric nurses, psychologists, and anesthesia residents. Initial feedback included shortening the training presentation and adding video examples of the desired adult behavior, implementing in-person coaching for HCPs after didactic training, and creating parent pamphlets for the nurses and/or doctors' offices to distribute before surgery. The intervention was modified accordingly.

Description of P-TIPS. The Provider-Tailored Intervention for Perioperative Stress is a multimodal training program consisting of specialized training seminars for anesthesiologists and nurses. P-TIPS includes didactic information on the previously identified desired and undesired behaviors, video modeling of effective and ineffective use of these behaviors, and *in vivo* coaching and feedback sessions. In all, HCPs attended one training session, lasting for no more than 2 h, and at least one *in vivo* coaching session. Anesthesiologists (attending and residents) were trained in modifying their behaviors during interactions with children and families. Nurses were trained to modify their behavioral interactions but were also trained in providing information to parents (*i.e.*, the train-the-trainer approach). Our findings that parents required prompting to exhibit desired behaviors led to the conclusion that it would be more effective to train the HCPs and allow them to model and prompt parents for the desired behaviors. In light of this and because nurses were included in the intervention and have the most contact with parents before surgery, they were charged with educating and training parents on specific behaviors and how to be responsive to cues from anesthesiologists for how to interact with the child on the day of surgery. Therefore, in addition to modifying their own behaviors, the nurses were to train and educate the parents. In this regard, parents were indirectly targeted *via* the intervention, both as a result of training by nurses and through behavioral cues from the anesthesiologists for how to interact with their child. The P-TIPS research involved four phases: baseline, training, posttraining, and booster sessions (see Appendix 2).

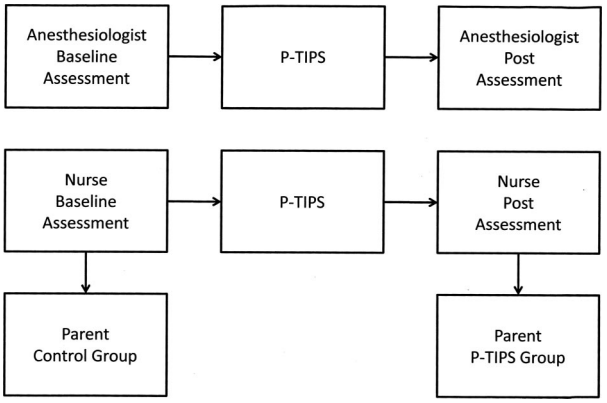

Fig. 1. Flowchart of study procedures by participant type. P-TIPS = Provider-Tailored Intervention for Perioperative Stress.

Intervention Pilot Testing

As shown in figure 1, this pilot study consisted of three phases: baseline assessment, intervention training, and postintervention assessment. HCPs and families were recruited from the outpatient surgery centers at the medical centers at the University of California, Los Angeles and the University of California, Irvine.

Participants

Families. Children at both sites were 2–14 yr of age and undergoing outpatient elective surgery (average age in baseline group: 5.7 yr, SD = 2.6 yr; postintervention group: 5.5 yr, SD = 2.8 yr). Children who did not speak English or who had an American Society of Anesthesiologists status of III or IV were excluded from the study. Eligible parents were fluent in English and 18 yr or older. As shown in figure 2, of the potentially eligible families, 77.5% consented and participated in the baseline phase, and 97.6% of the eligible families consented and participated in the postintervention assessment.

Healthcare Providers. Healthcare providers who were directly involved with care of children on the day of surgery (day surgery and operating room [OR] nurses, attending and resident anesthesiologists) were recruited to participate; all HCPs who were approached at both sites provided consent to participate. Participants at the University of California, Los Angeles included attending faculty pediatric anesthesiologists and preoperative admitting nurses ($n = 4$; $n = 5$, respectively). Participants at the University of California, Irvine included first-year resident anesthesiologists and preoperative admitting nurses ($n = 7$; $n = 5$, respectively).

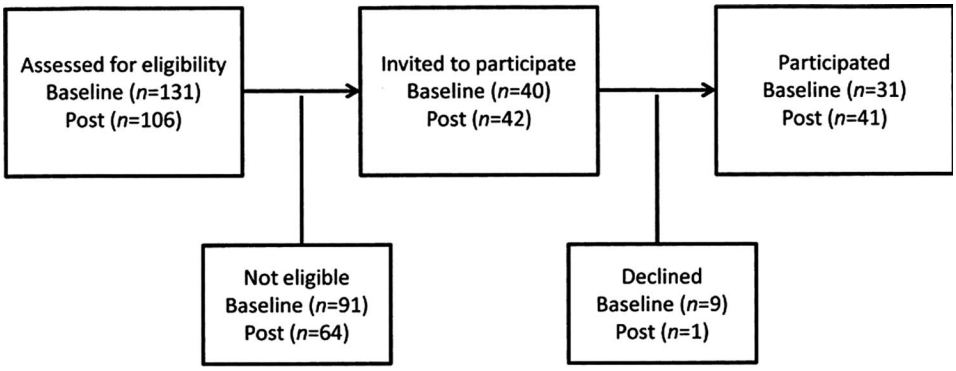

Fig. 2. Flowchart of patient recruitment.

Pilot Study Measures

Anesthesia Care Providers Behavior Frequency Measure. Behaviors of HCPs and parents were captured and coded using an adapted form of the Revised-Perioperative Child-Adult Medical Procedure Interaction Scale (R-PCAMPIS).[16,24–25] Operational definitions of the 11 targeted behaviors were extracted from the larger observational scale. The R-PCAMPIS has been demonstrated to have excellent reliability and validity.[16,24–25] Modifications to the original PCAMPIS were made to facilitate the interface between the coding system and the Observer software (Noldus Inc., Wageningen, The Netherlands). Specifically, the original PCAMPIS was modified to differentiate between state codes (*i.e.*, codes representing behaviors with meaningful durations) and event codes (*i.e.*, codes representing behaviors with meaningful frequencies, such as reassuring comments). This observational measure was used to record the frequency of HCPs and parents displaying desired (nonprocedural talk, humor, giving actual control, and current medical reinterpretation) and undesired (reassurance, empathy, apology, giving implied control, medical talk, and future medical reinterpretation) behaviors. The frequency of each behavior was recorded during distinct phases for anesthesiologists and parents: Preoperative Holding, Walk to the OR, Entrance to the OR, Anesthesia Mask Placement, and during Induction of Anesthesia. Nurses' interactions with children were limited to the holding room, so their behaviors were recorded only during the holding phase. To account for the varying amounts of time HCPs and parents were present at each of these phases, behavior frequencies were converted to rates of desired and undesired behaviors (total number of desired or undesired behaviors/total time present).

Educating Parents on Their Roles. A nurse's ability to convey to parents what was going to occur, when it would occur, what parents were expected to do and the ability to ask and answer questions from children and parents were rated on a scale of 0 (poor quality) to 2 (high quality). A score of 0 (poor quality) was given for brief explanations that did not include all relevant information, failure to explain parents' roles, and not asking and answering questions from both children and parents; whereas, a score of 2 (high quality) was given for detailed explanations that included all relevant information about what to expect in the different parts of the perioperative environment and consistently asking and addressing questions from parents and children. Nurses received a score for educating parents on their role in each of the following time periods: Preoperative Holding, Walk to the OR, and in the OR. Scores for each of the three phases were summed to create an overall quality score that ranged from 0 (low quality) to 6 (high quality).

Educating Parents on Behaviors. A checklist of 10 dichotomous (yes or no) questions indicated whether nurses had properly defined and explained the desired and undesired behaviors to parents. Scores ranged from 0 (no behaviors) to 10 (all behaviors).

Quality of Interactions. Observers rated the overall quality of the nurses' interactions with the children and parents. Nurses were rated on a scale of 0 (low quality) to 2 (high quality). Low-quality interactions were marked by an inability of the nurse to adjust and adapt the training and examples to the children's interests, inability to use developmentally appropriate language, and the nurse giving inappropriate examples of behaviors; a high-quality interaction was marked by the nurse's ability to incorporate children's and parents' interests and input and use developmentally appropriate language.

Child Distress—Yale Preoperative Anxiety Scale, Modified (m-YPAS). The m-YPAS[34] is a structured observational measure of preoperative anxiety in children consisting of 27 items in five domains of behavior indicating anxiety in young children (activity, emotional expressivity, state of arousal, vocalization, and use of parents). The m-YPAS domains have good to excellent inter- and intraobserver reliability and demonstrate construct validity with other global behavioral measures of anxiety. The adjusted m-YPAS total score ranges from 0 to 100, with higher scores indicating greater anxiety.

Pilot Study Procedures

Healthcare providers were informed of the study before study initiation and provided informed written consent. HCPs were assured that participation in the study was vol-

untary. Parents or guardians of potential child participants were notified about the study as much as 2 weeks before surgery *via* the telephone or on the day of surgery in person. On the day of the surgery, researchers reviewed the consent and assent forms with parents and children. Parents and children older than 6 yr completed consent or assent and Health Insurance Portability and Accountability Act forms. A research associate videotaped the HCP interactions with children and parents from the time they entered the holding room until the induction of anesthesia. Children's anxiety was observed and measured using the m-YPAS. One parent accompanied the child into the OR and left after the induction of anesthesia. Children who participated in this study did not receive sedative premedication (midazolam). Anesthesia was induced in a standardized manner; upon arrival in the OR, a saturation of peripheral oxygen probe was placed on the child's finger and a scented anesthesia mask was presented to the child. The facemask was scented based on the child's request. Nitrous oxide-oxygen was introduced in a ratio of 3/7 l flow for 2 min, and sevoflurane was started in a concentration of 0.5% then increased every three breaths to a maximum of 6%.

Behavioral Coding. Two research assistants completed the behavioral coding. The lead coder previously had been trained to code, had used the R-PCAMPIS extensively, and served as a trainer for the other coder. The second coder was trained to code the R-PCAMPIS by first using study-independent training videos. Coding for the different behaviors was done in different passes to ensure that all HCP and parent behaviors were captured (*i.e.*, each behavior was coded in a separate pass). The two raters established interrater reliability by both coding the same videos for all behaviors for 10% of the sample. Differences were discussed and resolved until the two raters established a minimum of 80% agreement for each of the behaviors (range: 80–100% agreement).

Statistical Analysis

Data analyses were conducted using SPSS 18.0 (SPSS Inc., Chicago, Illinois). To assess whether the intervention successfully changed HCP behaviors, a series of Wilcoxon signed-rank tests were conducted comparing baseline rates of desired and undesired behavior to posttraining rates for anesthesiologists. Because the parents and children were in either the baseline or intervention condition, Mann–Whitney U tests were conducted to assess differences in rates of parental behaviors and children's anxiety levels. Nonparametric tests were used in consideration of the small sample size and nonnormal distribution. In addition, because residents and attending anesthesiologists have differing levels of experience, analyses were separated between the two groups of physicians. Because of the pilot nature of this study, the small sample size would unduly influence the rate of Type II errors (*i.e.*, failing to reject the null hypothesis; nonsignificant *P* values) from traditional paired *t* tests.[35] In consideration of this issue, Cohen's *d* effect sizes were calculated and displayed alongside traditional significance test results. Cohen's *d* effect sizes generally are classified as small ($d = 0.20–0.49$), medium ($d = 0.50–0.79$), and large ($d \geq 0.80$). Effect sizes help to indicate the magnitude of the effect (practical significance), whereas *P* values help to indicate the probability of a significant finding (statistical significance).[35] The effect sizes displayed were calculated with consideration to the dependent nature of the data (*i.e.*, within study differences) for the HCP data; therefore, the correlation between the two scores was factored into the effect size calculations.[36] Effect sizes and *P* values were taken into consideration in the discussion of the results.

Results

Change in Physician Behavior

Table 1 shows rates of behaviors of attending and resident anesthesiologists. Residents showed a meaningful increase in their rates (*i.e.*, number of behaviors per minute) of *desired* behaviors, as indicated by the large effect sizes (average $d = .97$) in all the discrete time periods. Attending physicians in this sample demonstrated large, meaningful changes in their rates of desired behaviors during the Preoperative Holding and Walk to the OR time periods. These increased rates approached statistical significance during the Walk to the OR and during Preoperative Holding. Residents' change in rates of *undesired* behaviors were primarily small medium in their magnitude (average $d = .31$; see table 2). Despite these decreases in the rates of undesired behaviors, and given their potentially meaningful significance, paired *t* tests failed to reach statistical significance for any of the comparisons of residents' change in undesired behavior rates. Attending physicians' rates of undesired behaviors decreased at a larger rate (see table 2) than did those of the residents. Attending physicians had a larger decrease in the rate of undesired behaviors denoting large and meaningful effect sizes (average $d = 1.19$).

Change in Nurse Behavior

Nurses' education and behavioral scores demonstrated a significant increase in the nurses' ability to present information to parents, modeling of *desired* behaviors, and quality of their interactions with children after the intervention (see table 3). Nurses consistently had a large change in their ability to present information to parents and demonstrate effective behaviors (average $d = 1.59$). Moreover, the quality of nurses' interactions with families (*i.e.*, sensitive to children's interests) showed significant improvement.

Change in Parental Behaviors

As indicated by table 4, parents' rates of *desired* behaviors were higher in the postintervention group than the baseline

Table 1. Effect Sizes and *P* Values of Changes in the Rates of Desired Behaviors by Residents ($n = 7$) and Attending Faculty ($n = 4$)

Physician	Time Period	Assessment Point	Desired Behavior Rates				
			Mean	SD	Effect Size	% Change	*P* Value
Residents	Preoperative holding area	Pre	2.6	3.7	0.89	+129.9	0.09
		Post	6.0	2.8			
	Walk to the OR	Pre	2.2	1.5	1.49	+275.0	0.02
		Post	8.1	4.9			
	Entry into the OR	Pre	1.5	2.1	0.64	+139.4	0.13
		Post	3.6	2.3			
	Anesthesia mask placement	Pre	2.1	1.8	1.00	+110.5	0.04
		Post	4.4	2.5			
	Induction of anesthesia	Pre	2.1	1.6	0.96	+110.5	.06
		Post	4.4	2.6			
Attending faculty	Preoperative holding area	Pre	4.1	0.9	1.30	+77.2	0.07
		Post	7.2	2.1			
	Walk to the OR	Pre	2.8	2.2	1.17	+192.3	0.07
		Post	8.1	2.7			
	Entry into the OR	Pre	6.7	2.7	0.27	+14.0	0.72
		Post	7.7	1.8			
	Anesthesia mask placement	Pre	7.4	7.8	0.22	+25.4	0.72
		Post	9.2	1.8			
	Induction of anesthesia	Pre	7.6	6.3	0.22	+23.6	0.47
		Post	9.4	2.2			

Cohen's *d*: small ($d = 0.20–0.49$), medium ($d = 0.50–0.79$), large ($d \geq 0.80$).
OR = operating room; Post = postintervention; Pre = preintervention.

group across all time periods (small to medium effect size, average $d = .43$). Parents in the intervention group also demonstrated lower rates of *undesired* behaviors during all time periods. These differences were small to medium in their effect sizes (average $d = .34$). Despite the meaningful differences, as indicated by their effect sizes, only the difference during the Walk to the OR period was statistically significant.

Table 2. Effect Sizes and *P* Values of Changes in the Rates of Undesired Behaviors by Residents ($n = 7$) and Attending Faculty ($n = 4$)

Physician	Time Period	Assessment Point	Undesired Behavior Rates				
			Mean	SD	Effect Size	% change	*P* Value
Residents	Preoperative holding area	Pre	0.2	0.2	0.15	−24.1	0.74
		Post	0.1	0.2			
	Walk to the OR	Pre	0.5	0.9	0.17	−34.9	0.66
		Post	0.3	0.8			
	Entry into the OR	Pre	0.3	0.2	0.33	−64.7	0.69
		Post	0.1	0.7			
	Anesthesia mask placement	Pre	0.5	0.6	0.42	−59.5	0.27
		Post	0.2	0.3			
	Induction of anesthesia	Pre	0.6	0.5	0.74	−70.1	0.04
		Post	0.2	0.3			
Attending faculty	Preoperative holding area	Pre	0.9	1.2	0.91	−79.8	0.07
		Post	0.2	0.1			
	Walk to the OR	Pre	0.6	0.9	1.20	−66.7	0.29
		Post	0.2	0.2			
	Entry into the OR	Pre	1.3	1.4	2.15	−89.8	0.07
		Post	0.1	0.2			
	Anesthesia mask placement	Pre	1.1	1.0	0.89	−84.7	0.14
		Post	0.2	0.1			
	Induction of anesthesia	Pre	1.1	0.8	0.81	−65.0	0.14
		Post	0.4	0.3			

Cohen's *d*: small ($d = 0.20–0.49$), medium ($d = 0.50–0.79$), large ($d \geq 0.80$).
OR = operating room; Post = postintervention; Pre = preintervention.

Table 3. Effect Sizes and *P* Values of Changes in Informing Parents, Quality of Interactions, and Modeling of Behaviors by Nurses ($n = 10$)

	Assessment Point	Mean	SD	Effect Size	% Change	*P* Value
Educating parents on their role	Pre	0.3	0.4	1.93	+742.3	0.007
	Post	2.2	1.6			
Educating parents on behaviors	Pre	0.0	0.1	1.44	+6,550.0	0.007
	Post	1.3	1.1			
Quality of interaction	Pre	0.1	0.3	2.13	+872.7	0.007
	Post	1.1	0.6			
Rate of desired behavior modeling	Pre	0.9	0.5	0.89	+142.9	0.017
	Post	2.2	1.3			
Rate of undesired behavior modeling	Pre	0.1	0.1	0.38	−50.0	0.18
	Post	0.1	0.1			

Note: Cohen's *d* - small ($d = 0.20$ to 0.49), medium ($d = 0.50$ to 0.79), large ($d \geq 0.80$).
Post = postintervention; Pre = preintervention.

Change in Children's Anxiety

Children in the intervention group showed meaningful differences in their anxiety levels when they were assessed during the Walk to the OR and Induction of Anesthesia phases and compared with the children at baseline, as indicated by small and medium effect sizes (see table 5). Moreover, the difference was statistically significant for children in the intervention during the Induction of Anesthesia phase and approaching significance for the Walk to the OR phase.

Discussion

The goal of the current report was to describe the development of a new preoperative intervention (P-TIPS) aimed at changing the behaviors of HCPs and parents and examine the feasibility of behavior change as a function of the intervention. Under the conditions of this study, we demonstrated that P-TIPS was successful at increasing rates of desired behaviors and reducing rates of undesired behaviors among anesthesiologists, nurses, and parents. Moreover, although it was not the primary aim of the study, we demonstrated a reduction in children's preoperative anxiety as a result of the intervention. As a whole, the current study supports the feasibility of the empirically based behavioral intervention targeted at changing the behaviors of HCPs and parents to reduce children's anxiety.

Although previous research has suggested that physician behavior may not be readily modified, anesthesiologists in the current investigation were amenable to behavior change as a result of P-TIPS. Included in this study were attending and resident anesthesiologists; as previously predicted, there were differences in the effectiveness of the training between the two groups. Resident anesthesiologists demonstrated

Table 4. Effect Sizes and *P* Values of Differences in the Rates of Desired and Undesired Parental Behaviors between Baseline ($n = 31$) and Intervention Group ($n = 41$) Parents

Type of Behavior	Time Period	Group	Parental Behavior Rates				
			Mean	SD	Effect Size	% Change	*P* Value
Desired	Walk to the OR	Baseline	0.9	1.4	0.60	+204.1	0.17
		Intervention	2.9	4.3			
	Entry into OR	Baseline	1.5	1.6	0.41	+199.4	0.66
		Intervention	4.3	9.7			
	Anesthesia mask placement	Baseline	1.2	2.0	0.38	+73.9	0.22
		Intervention	2.1	2.7			
	Induction of anesthesia	Baseline	1.2	2.1	0.30	+52.1	0.27
		Intervention	1.8	2.1			
Undesired	Walk to the OR	Baseline	0.5	1.0	0.61	−90.5	0.04
		Intervention	0.0	0.2			
	Entry into OR	Baseline	1.4	3.9	0.32	−67.4	0.92
		Intervention	0.4	0.9			
	Anesthesia mask placement	Baseline	1.4	3.3	0.30	−54.4	0.90
		Intervention	0.6	1.2			
	Induction of anesthesia	Baseline	1.1	2.2	0.16	−27.3	0.82
		Intervention	0.8	1.4			

Cohen's *d*: small ($d = 0.20–0.49$), medium ($d = 0.50–0.79$), large ($d \geq 0.80$).
OR = operating room.

Table 5. Effect Sizes and *P* Values of Differences in Children's Anxiety between Baseline ($n = 31$) and Intervention Group ($n = 41$) Children

		Anxiety Levels				
Time Period	Group	Mean	SD	Effect Size	% Change	*P* Value
Preoperative holding	Baseline	39.4	11.5	0.05	+1.8	0.93
	Intervention	40.1	14.5			
Walk to the OR	Baseline	42.3	10.5	0.52	−12.0	0.06
	Intervention	37.2	8.8			
Induction of anesthesia	Baseline	54.2	17.3	0.38	−14.0	0.006
	Intervention	46.6	21.3			

Cohen's *d*: small ($d = 0.20–0.49$), medium ($d = 0.50–0.79$), large ($d \geq 0.80$).
OR = operating room.

greater increases in rates of desired behaviors; whereas, attending anesthesiologists demonstrated greater decreases in rates of undesired behaviors. Attending anesthesiologists, having more experience than their resident counterparts, generally had higher rates of baseline desired behaviors, which likely contributed to the lower gains in this area. That is, there was likely a ceiling effect given attending anesthesiologists had a larger developed repertoire of desired behaviors before the intervention. However, in consideration of anesthesiologists' rates of undesired behaviors, attending physicians' greater years of experience may also allow for the incorporation of some undesired behaviors into their usual manner of interaction with patients and parents. This is most likely the reason that attending anesthesiologists demonstrated greater reductions in the rates of undesired behaviors compared with their resident counterparts. Although both attending and resident anesthesiologists' behaviors were malleable, residents exhibited the largest behavioral changes. Residents' amenability to the training intervention represents a potential key population to shape and educate in efforts to change the clinical practice of pediatric anesthesiology.

Nurses represent medical specialists who can have a tremendous amount of influence over children's experience in the perioperative environment. Nurses' behaviors were highly malleable to the training; nurses had the largest changes in their behaviors. Not only were nurses effective in integrating information from the training into their behavioral repertoires, they also were able to effectively convey this knowledge to the parents. In turn, parents in the intervention condition demonstrated higher rates of desired behaviors and lower rates of undesired behaviors; this is a strong indicator of the effectiveness of using nurses as trainers for parents in the clinical setting.

Influencing parents' behavior through training provided directly by nurses and from anesthesiologists' cues for how to interact with the child in coping-promoting ways suggests that it is not necessary to conduct specialized seminars or training sessions with every parent as a part of the intervention. This approach of training HCPs who interact with multiple parents helps to reduce the logistical and financial considerations of implementing this type of program in a clinical setting. The program can be coordinated with the HCPs at each hospital, and nurses subsequently would help to educate parents as a part of their interactions with the families.

Although these are strong preliminary results, a couple of methodologic limitations should be noted. The nurses' parental education revealed the training status to the raters, which may have influenced the behavioral rating. Although this is a potential limitation, the investigators could not avoid this because of the nature of this study. In addition, although the previously published[24,25] behavioral coding measure (R-PCAMPIS) was slightly modified from its original version,[16] it did not undergo an extensive validation process within the context of this study.

The current study confirms the feasibility of a behavioral change intervention and that the amount and type of training provided was appropriate to change HCP and parent behavior, as noted by clinically meaningful effect sizes. Anecdotally, all HCPs who were part of this study were enthusiastic about it and willing engage in this type of training because it is highly applied and relevant to clinical practice. Our next step is to examine if changes in HCP and parent behavior are associated with improved postoperative outcomes. This preliminary study was not powered to assess child outcomes, only the feasibility and dose-effectiveness of the intervention. However, our findings with regard to children's outcomes are promising in terms of the ability of the intervention to decrease children's preoperative distress and perhaps postoperative outcomes, such as analgesic requirements. These preliminary findings regarding P-TIPS show promise to be able to change HCP and parent behaviors and subsequently reduce children's anxiety. In addition, P-TIPS potentially may represent a viable, affordable alternative to pharmacologic solutions to managing children's anxiety. The authors of the current study have been awarded a multiyear National Institutes of Health grant to test this intervention in a multisite study during the next 5 yr.

The underlying concept of all current interventions in this field is to treat the individual child and parent dyad directly (*e.g.*, a sedative or preparation program). The fact

that P-TIPS is directed at the HCP and not the individual child-parent dyad may change the field, because the training of one HCP may result in improvement of anxiety and postoperative outcomes in large numbers of children and parents the HCP encounters in clinical practice. We are not advocating the cessation of use of current interventions but seek to provide this intervention as a complementary approach. However, in future studies it will be important to assess behavior maintenance after training and determine whether booster sessions may be required. Moreover, it would be informative to examine the conditions under which these behaviors are best maintained. In sum, P-TIPS is a promising new alternative method for managing children's preoperative anxiety that can have a large impact on children's health with minimal impact on hospital logistics and cost.

References

1. Graves EJ: National hospital discharge survey: Annual summary, 1991. Vital Health Stat 13 1993; 114:1–62
2. Beeby DG, Hughes JO: Behaviour of unsedated children in the anaesthetic room. Br J Anaesth 1980; 52:279–81
3. Kain ZN, Mayes LC, O'Connor TZ, Cicchetti DV: Preoperative anxiety in children. Predictors and outcomes. Arch Pediatr Adolesc Med 1996; 150:1238–45
4. Kain ZN: Postoperative maladaptive behavioral changes in children: Incidence, risks factors and interventions. Acta Anaesthesiol Belg 2000; 51:217–26
5. Kain ZN, Mayes LC, Caldwell-Andrews AA, Karas DE, McClain BC: Preoperative anxiety, postoperative pain, and behavioral recovery in young children undergoing surgery. Pediatrics 2006; 118:651–8
6. Kain ZN, Wang SM, Mayes LC, Caramico LA, Hofstadter MB: Distress during the induction of anesthesia and postoperative behavioral outcomes. Anesth Analg 1999; 88:1042–7
7. Kain ZN, Caldwell-Andrews AA, Mayes LC, Weinberg ME, Wang SM, MacLaren JE, Blount RL: Family-centered preparation for surgery improves perioperative outcomes in children: A randomized controlled trial. ANESTHESIOLOGY 2007; 106:65–74
8. McCann M, Kain ZN: Management of preoperative anxiety in children: An update. Anes Analg 2001; 93:98–105
9. Viitanen H, Annila P, Viitanen M, Tarkkila P: Premedication with midazolam delays recovery after ambulatory sevoflurane anesthesia in children. Anesth Analg 1999; 89:75–9
10. Kain ZN, MacLaren JE, Herrmann L, Mayes L, Rosenbaum A, Hata J, Lerman J: Preoperative melatonin and its effects on induction and emergence in children undergoing anesthesia and surgery. ANESTHESIOLOGY 2009; 111:44–9
11. Kain ZN, Mayes LC, Caramico LA, Silver D, Spieker M, Nygren MM, Anderson G, Rimar S: Parental presence during induction of anesthesia. A randomized controlled trial. ANESTHESIOLOGY 1996; 84:1060–7
12. 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
13. 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
14. Piira T, Hayes B, Goodenough B, von Baeyer CL: Effects of attentional direction, age, and coping style on cold-pressor pain in children. Behav Res Ther 2006; 44:835–48
15. Wright KD, Stewart SH, Finley GA, Buffett-Jerrott SE: Prevention and intervention strategies to alleviate preoperative anxiety in children: A critical review. Behav Modif 2007; 31:52–79
16. Caldwell-Andrews AA, Blount RL, Mayes LC, Kain ZN: Behavioral interactions in the perioperative environment: A new conceptual framework and the development of the perioperative child-adult medical procedure interaction scale. ANESTHESIOLOGY 2005; 103:1130–5
17. Blount RL, Corbin S, Sturges J, Wolfe V, Prater J, James L: The relationship between adults' behavior and child coping and distress during BMA/LP procedures: A sequential analysis. Behav Ther 1989; 20:585–601
18. Manimala MR, Blount RL, Cohen LL: The effects of parental reassurance *versus* distraction on child distress and coping during immunizations. Children's Health Care 2000; 29:161–77
19. Cohen LL, Blount RL, Panopoulos G: Nurse coaching and cartoon distraction: An effective and practical intervention to reduce child, parent, and nurse distress during immunizations. J Pediatr Psychol 1997; 22:355–70
20. Uman LS, Chambers CT, McGrath PJ, Kisely S: A systematic review of randomized controlled trials examining psychological interventions for needle-related procedural pain and distress in children and adolescents: An abbreviated Cochrane review. J Pediatr Psychol 2008; 33:842–54
21. Blount RL, Bunke V, Zaff J: Bridging the gap between explicative and treatment research: A model and practical implications. J Clin Psychol Med Settings 2000; 7:79–90
22. Blount RL, Zempsky WT, Jaaniste T, Evans S, Cohen LL, Devine CA, Zeltzer LK: Management of pain and distress due to medical procedures, Handbook of Pediatric Psychology, 4th edition. Edited by Roberts M, Steele R. New York, Guilford Press, 2009, pp 171–88
23. Sadhasivam S, Cohen LL, Szabova A, Varughese A, Kurth CD, Willging P, Wang Y, Nick TG, Gunter J: Real-time assessment of perioperative behaviors and prediction of perioperative outcomes. Anesth Analg 2009; 108:822–6
24. Chorney JM, Torrey C, Blount R, McLaren CE, Chen WP, Kain ZN: Healthcare provider and parent behavior and children's coping and distress at anesthesia induction. ANESTHESIOLOGY 2009; 111:1290–6
25. Chorney JM, Kain ZN: Behavioral analysis of children's response to induction of anesthesia. Anesth Analg 2009; 109:1434–40
26. Chorney JM, Garcia AM, Berlin KS, Bakeman R, Kain ZN: Time-window sequential analysis: An introduction for pediatric psychologists. J Pediatr Psychol 2010; 35:1061–70
27. Chorney JM, Kain ZN: Family-centered pediatric perioperative care. ANESTHESIOLOGY 2010; 112:751–5
28. Bauchner H, Simpson L, Chessare J: Changing physician behaviour. Arch Dis Child 2001; 84:459–62
29. Bero LA, Grilli R, Grimshaw JM, Harvey E, Oxman AD, Thomson MA: Getting research findings into practice: Closing the gap between research and practice: An overview of systematic reviews of interventions to promote the implementation of research findings. The Cochrane Effective Practice and Organization of Care Review Group. BMJ 1998; 317:465–8
30. Davis D, O'Brien MA, Freemantle N, Wolf FM, Mazmanian P, Taylor-Vaisey A: Impact of formal continuing medical education: Do conferences, workshops, rounds, and other traditional continuing education activities change physician behavior or health care outcomes? JAMA 1999; 282:867–74
31. Grol R, Grimshaw J: From best evidence to best practice: Effective implementation of change in patients' care. Lancet 2003; 362:1225–30
32. Wyszewianski L, Green LA: Strategies for changing clinicians' practice patterns: A new perspective. J Fam Pract 2000; 49:461–4
33. Blount R, Sturges J, Powers S: Analysis of child and adult

behavioral variations by phase of medical procedure. Behav Ther 1990; 21:33–48

34. Kain ZN, Mayes LC, Cicchetti DV, Caramico LA, Spieker M, Nygren MM, Rimar S: A measurement tool for preoperative anxiety in young children: The Yale Preoperative Anxiety Scale. Child Neuropsychol 1995; 1:203–10

35. Fan XT: Statistical significance and effect size in education research: Two sides of a coin. J Educ Res 2001; 94: 275–82

36. Morris SB, DeShon RP: Combining effect size estimates in meta-analysis with repeated measures and independent-groups designs. Psychol Methods 2002; 7:105–25

Appendix 1. Description of Targeted Desired and Undesired Behaviors

Behaviors	Description
Desired behaviors	
Nonprocedural, distracting talk	Distracting comments that steer children's attention away from the medical procedure (*e.g.*, talk about observable toys, or unobservable topics, such as their pets, favorite movies)
Humor	Jokes that help to change the focus of children's attention away from the medical procedure
Actual choices with clear limitations to child	Giving a choice to the child, one that does not allow the child to refuse the procedure completely (*e.g.*, "do you want the strawberry or bubblegum smell?")
Medical reinterpretation of visible equipment	Statements that reframe the current medical procedure or equipment into something fun and positive (*e.g.*, here's an astronaut mask)
Undesired behaviors	
Reassuring, apologetic, and empathetic statements	Reassuring statements such as "It's okay" and "don't worry"; apologetic statements such as "I'm sorry"; and empathetic statements such as "I know it's hard" serve to focus the child on his or her feelings or distress
Implied, unlimited choices to child	Asking the child questions that the child has no control over (*e.g.*, "Are you ready to go?" or "Do you want to breathe through the mask?")
Medical reinterpretation of nonvisible equipment	Reframing the procedure and/or equipment that is not in the child's immediate environment (*e.g.*, reinterpreting the mask while the child is still in the holding room)
Excessive medical talk	Providing too much technical information regarding the procedure and/or equipment

Appendix 2. Description of Intervention Phases

Phase	Description
Baseline observations	Healthcare provider (HCP), child, and parent interactions were observed to assess baseline behavior.
Training phase	
Training seminars	Anesthesiologists and preoperative nurses attended separate seminars focused on their prescribed specific desired preoperative roles (*i.e.*, anesthesiologist training focused on parental presence and desired behaviors before and during anesthesia induction, whereas nurse training discussed parent education and parental roles before surgery). Both seminars consisted of an approximately 2-h training that outlined and described distress-related and coping-related behaviors. The groups were also presented with multiple video examples from actual patient-provider interactions and were asked to discuss strengths and weaknesses of each video.
Coaching	After completing the training seminar, each HCP participated in at least one coaching session. During each coaching session, research personnel observed and rated the anesthesiologist or nurse's behavior while working with a pediatric patient during the preoperative period and induction of anesthesia. After the HCP concluded each case, research personnel met with them to discuss their interactions and brainstorm strengths and weaknesses.
Posttraining	Once each HCP was coached and received satisfactory feedback on their performance, research personnel observed HCP, child, and parent interactions to collect posttraining data.
Booster sessions	To ensure the maintenance of desired behaviors, research personnel met with participating HCPs during the posttraining phase at 2, 4, and 6 months after training to observe them with a patient, give feedback, and review target behaviors.