Adult–Child Interactions in the Postanesthesia Care Unit

Behavior Matters

Jill MacLaren Chorney, Ph.D., R.Psych.,* Edwin T. Tan, Ph.D.,† Zeev N. Kain, M.D., M.B.A.‡

ABSTRACT

Background: Many children experience significant distress before and after surgery. Previous studies indicate that healthcare providers' and parents' behaviors may influence children's outcomes. This study examines the influence of adults' behaviors on children's distress and coping in the postanesthesia care unit.

Methods: Children aged 2–10 yr were videotaped during their postanesthesia care unit stay (n = 146). Adult and child behaviors were coded from video, including the onset, duration, and order of behaviors. Correlations were used to examine relations between behaviors, and time-window sequential statistical analyses were used to examine whether adult behaviors cued or followed children's distress and coping.

Results: Sequential analysis demonstrated that children were significantly less likely to become distressed after an adult used empathy, distraction, or coping/assurance talk than they were at any other time. Conversely, if a child was already distressed, children were significantly more likely to remain distressed if an adult used reassurance or empathy than they were at any other time.

What We Already Know about This Topic

- Healthcare providers' and parents' behavior may influence how pediatric patients cope with recovery from surgery

What This Article Tells Us That Is New

- Children were less likely to become distressed after adults used empathy, distraction, and coping/assurance talk
- Children who were already distressed were more likely to remain distressed when adults used reassurance or empathy
- Reassurance should be avoided when a postoperative child is already distressed

Children were more likely to display coping behavior (*e.g.*, distraction, nonprocedural talk) after an adult used this behavior.

Conclusions: Adults can influence children's distress and coping in the postanesthesia care unit. Empathy, distraction, and assurance talk may be helpful in keeping a child from becoming distressed, and nonprocedural talk and distraction may cue children to cope. Reassurance should be avoided when a child is already distressed.

F AMILY-CENTERED care has garnered attention over the past few years and has been promoted by organizations such as the Institute of Medicine and the National Institutes of Health. Within the context of pediatric perioperative care, a growing body of research has examined the role of parents in the postanesthesia care unit (PACU).[1,2] Reports of effects of parental presence in the PACU on anxiety and pain in children are mixed, and although some studies report decreased crying and fewer postoperative behavioral changes in children whose parents were present in the PACU, other studies have found no change.[3–7] These contradictory results parallel earlier studies regarding parental presence during induction of anesthesia.[3–7] Research on parental presence during induction of anesthesia benefited significantly from a shift from studying the mere impact of parental presence, to an understanding of how adults and children behaviorally interact during induction of anesthesia.[8,9] We suggest that the area of research of parental presence in the PACU may

* Assistant Professor, Departments of Anesthesiology, Pain Management and Perioperative Medicine, and Psychology, Dalhousie University, Halifax, Nova Scotia, Canada. † Postdoctoral Fellow, Department of Anesthesiology and Perioperative Care, University of California, Irvine, Irvine, California. ‡ Professor, Chair, and Associate Dean of Clinical Operations, Departments of Anesthesiology and Perioperative Care, Pediatrics, Psychiatry, and Physical Medicine and Rehabilitation, University of California, Irvine, and Child Study Center, Yale University, New Haven, Connecticut.

Address correspondence to Dr. MacLaren Chorney: Centre for Pediatric Pain Research, IWK Health Centre, 8th Floor (South), 5850 University Avenue, P. O. Box 9700, Halifax, Nova Scotia B3K 6R8, Canada. jill.chorney@dal.ca. This article may be accessed for personal use at no charge through the Journal Web site, www.anesthesiology.org.

benefit from a similar change in the conceptual framework to focus on adult–child interactions.

Within the larger context of general adult–child interactions, it has long been established that adults have the ability to influence children's behaviors, especially in new and stressful situations, including illness and medical procedures.[10–13] For instance, mothers that attend to children's symptoms tend to have children that express greater responses to these symptoms.[14–16] In medical procedures, adult behaviors such as giving control to the child, reassurance, apologies, criticisms, and empathy have been associated with greater child distress,[9,17] whereas distraction, talk about procedurally unrelated topics, and using humor have been associated with lower child distress.[14–20] Similar results have been found in studies involving induction of anesthesia in children.[9,18]

The majority of research on adult–child interactions has relied on correlational analyses. Alternatively, newer methods such as sequential analyses consider how interactions occur over time and can therefore comment on whether children's behaviors follow or precede adult behaviors.[19] For example, rather than asking whether adult reassurance is related to child distress (a correlational question), we can ask whether a child is more likely to start to display distress following adult reassurance than they are at any other time. Although causation can still not necessarily be concluded, sequential analysis answers questions on order of behaviors and how behaviors are related over time.

This study examines the relations between adult and child behaviors in the PACU using both correlational and sequential analyses. Although behaviors such as distraction and humor have clear benefits for children in the procedural setting,[20] it is unclear how these behaviors will function in the unfamiliar and prolonged exposure environment of the PACU. Learning more about the PACU will contribute to literature outside of the perioperative care environment, including children's responses to medical symptoms in general. On the basis of previous findings, it is hypothesized that emotion-focused behaviors (*e.g.*, reassurance) will lead to children becoming distressed, whereas distracting behaviors and non–emotion-focused behaviors (*e.g.*, nonprocedural talk, humor) will lead to children showing nondistress behaviors.

Materials and Methods

Data presented in this article are from a subset of children that participated in the National Institutes of Health–funded Behavioral Interaction-Perioperative Study that was aimed at assessing the influence of adult behaviors on children's perioperative distress. Results of the Behavioral Interaction-Perioperative Study focusing on the preoperative period and validation of children's postoperative behavioral coding are reported elsewhere.[9,21,22] Of the original 836 potential participants approached, 485 families chose not to participate. Most potential participants did not provide

reasons for declining, but those who did noted that they found the study to involve too much paperwork. Of the 351 participants who enrolled, postoperative data were available for the 146 participants included in this report. Postoperative data were not available for the remaining participants because of children/families withdrawing from the study (n = 10), equipment malfunction (n = 30), children not being placed in recorded PACU beds or going home too soon (n = 38), or inability to code behavioral data (*e.g.*, no sound, too muffled) (n = 137).

Participants

Participants in this study included 2- to 10-yr-old healthy children (American Society of Anesthesiologists physical status I or II) who were undergoing general anesthesia and surgery at Yale–New Haven Children Hospital and their accompanying parents. Children with an American Society of Anesthesiologists physical status of III or higher and children with autism or diagnosed developmental delay or who did not speak English were excluded from this study. Parents who accompanied their children on the day of surgery were also included in this study (the only exclusion criterion for parents was the inability to speak English). In addition to children and parents, nurses who cared for children in the recovery room were also included as participants in this study. All participants (*i.e.*, children, parents, and nurses) provided informed consent or assent for participation.

Measures

The Child Behavior Checklist–PACU[22] is an observational coding system that captures children's behaviors in the PACU setting. The coding system has previously demonstrated excellent reliability and evidence of validity.[22] The Child Behavior Checklist–PACU contains 23 operationally defined verbal and nonverbal child behaviors that are combined into empirically derived composites representing nonverbal distress (*e.g.*, guarding, nonverbal resistance, nonverbal request for help, crying), verbal distress (*e.g.*, verbal resistance, verbal pain, verbal request for help, negative verbal emotion), and nondistress behaviors (*e.g.*, information seeking, distraction, medical talk). The Child Behavior Checklist–PACU also includes operationally defined adult behaviors that have been identified and defined from procedural pain and preoperative anxiety research.[8,9,17,23–27] Relevant behaviors and operational definitions from existing measures were generally retained with modifications to include behaviors identified in study-independent observations of adults in the PACU. The appendix lists the PACU-specific adult behaviors and corresponding operational definitions and examples.

Procedures

Parents were recruited 1 to 7 days before their child's surgery and provided written informed consent. Children provided

written assent as age appropriate. No child received sedative premedication, and all children underwent mask induction with nitrous oxide and sevoflurane; we did not control for the anesthetic protocol or the postoperative pain management. This was intentional, as the purpose of the study was to result in a population of children with different levels of pain and anxiety in the PACU. Videotaping started when the child entered the PACU and continued throughout their entire stay. To efficiently capture the variability in PACU behaviors, three 5-min segments (total, 15 min) were selected and coded. The three, 5-min segments were as follows: (1) the first 5 min, during which the children were awake and coherent (no emergence delirium as defined clinically); (2) a 5-min segment revolving around removal of the line (2 min before removal and 3 min after removal); and (3) an additional 5-min segment selected to capture the child when they were distressed. Selectively identifying times in the video during which the child was distressed allowed for examination of interactions around children's distress behavior. The third segment was identified in the following way: a random number generator was used to identify a time point in the video. The video was then played forward until the first distress behavior was identified. Once the behavior was identified, a coding segment was defined that started 2 min before the onset of distress and continued until 3 min after. This procedure allowed us to examine the onset and potential offset of distress. If no distress behavior was shown on the video, the 5-min segment was started at the time identified by the random number generator. Each segment was reviewed multiple times to be coded. Coders watched each video once (*i.e.*, one pass) for each behavior they were coding.

Two independent research assistants coded data in this study; a primary coder coded all data and a secondary independent coder coded approximately 10% of data to check interrater reliability. Coders underwent a rigorous training protocol with the lead trainer, in which they were familiarized with the technological coding interface, Observer XT (Noldus Inc., Wageningen, The Netherlands), and the behavioral codes. Raters met to discuss coding and disagreements daily during the training period and weekly when coding study data. Coders were considered "trained" only after they met a kappa criterion of 0.80 with the lead trainer's codes. Data were coded using Observer XT software. Raters reviewed each segment multiple times (reviewed one time for each adult behavior). Coders were blinded to study hypotheses.

Statistical Analysis

Data were analyzed using SPSS 18.1 (SPSS Inc., Chicago, IL) and General Sequential Querier Software.[28] Preliminary analyses were conducted to examine interrater reliability on study data. Time- and event-based kappa coefficients are reported.[29] To account for slight variations in lengths of segments, rates were calculated by dividing the seconds in which the behavior occurs by the number of minutes in the observation. Correlations were used to examine the relations between adult and child behaviors. To control for heterogeneity in the sample, partial correlations are reported controlling for child age, previous surgery (yes/no), and type of procedure (painful/not painful).

Significant correlations were followed up using time-window sequential analysis.[19] Whereas correlations examine overall relations between adult and child behavior across observations, time-window sequential analysis examines how adult and child behaviors are related over time in each observation. Time-window sequential analyses ask whether a child behavior is more likely to follow an adult behavior within a specified time window than at any other time. In this way, sequential analysis provides more information on contingencies between behaviors than do correlations. Although there is some statistical guidance on the analysis of antecedent and target behavior duration,[30] the current recommendation for defining how long a time window should be is to use durations that make sense given the nature of the data.[28] The rate at which behavior is occurring in the data, and in our case the rate at which the participants are interacting, was relevant in choosing a relatively short (5-s) duration for the window in this study.

Time-window sequential analysis was conducted first at the individual dyad level; each adult–child dyad received a score that represented the strength of the temporal contingency between behaviors for that dyad. The score (Yule's Q) was based on the number of child behaviors that occur within the defined time window (*i.e.*, 5 s after the adult behavior) and the number of child behaviors that occur outside the defined time window. Yule's Q ranges from –1 to 1 and can be interpreted much like a correlation coefficient, with scores closer to 1 indicating stronger positive relations and scores closer to –1 indicating stronger negative relations. Yule's Q values of each dyad were then analyzed using standard statistical techniques to represent the sample of all dyads. Because Yule's Q values were not distributed normally in this sample, nonparametric statistics were used. Mean Yule's Q values are reported for descriptive purposes, and binomial tests are used to examine whether the distribution of positive and negative Yule's Q values differs significantly from the distribution that would be expected by chance.

Two sets of sequential analyses were conducted in this study. The first set of analyses examines whether children are more likely to start behaviors (*e.g.*, distress, distraction, nonprocedural talk) within 5 s after adult behaviors (*e.g.*, reassurance, empathy, distraction) than they are at any other time. For example, we ask whether children are more likely to start crying (nonverbal distress) within 5 s of adults' reassurance than they are at any other time. Positive results of this type of analysis suggest that adult behaviors cue children's behaviors. Because the duration of nonverbal behaviors are coded, the second set of analyses examines the co-occurrence of adult behavior during children's nonverbal behaviors. For example,

we ask whether adults are more likely to use reassurance while children are crying (nonverbal distress) than at any other time. Positive results of this type of analysis suggest that adults may be responding to children's behaviors rather than cueing children's behaviors.

Results

Participants

Participants included 146 parents of children undergoing general anesthesia and elective surgery. Children in this study ranged in age from 2–10 yr and were on average aged 4.8 ± 2.3 yr. Sex of children was relatively evenly distributed (49.6% boys). Mothers (n = 146) and fathers recruited for this study (n = 134) were of similar age (37.2 ± 5.8 yr and 39.6 ± 8.0 yr, respectively). Forty-five of the children had previously undergone surgery, 69 children had not undergone previous surgery, and no previous surgery data were available for 32 children. Children underwent a variety of procedures. Fifty-three underwent ear, nose, and throat procedures (e.g., tonsillectomy and/or adenoidectomy, turbinectomy); 16 underwent genital/urologic procedures (e.g., circumcision, orchidopexy, meatotomy, hydrocele), eight underwent orthopedic procedures (e.g., tendon release), eight underwent plastic procedures (e.g., lesion excision), and five underwent ophthalmologic procedure (e.g., strabismus). Of note, 30 children underwent procedures that typically do not generate high levels of postoperative pain (e.g., endoscopy, myringotomy).

Healthcare providers studied in the PACU included a group of 14 nurses who interacted with these families throughout the study. As is the usual practice, physicians were not present for the overwhelming majority of the time children spent in the PACU and were therefore excluded from analyses.

Preliminary Analyses: Interrater Reliability

Two research assistants independently coded 16 (10.9%) child participants and their accompanying adults. Kappa coefficients for adult behaviors fell in the good to excellent range.[31] Criticism had the highest kappa value (time-unit = 1.0, event-sequence = 1.0), followed by reassurance (time-unit = 0.95, event-sequence = 0.72). Kappa values for verbal distraction (time-unit = 0.89, event-sequence = 0.64), empathy (time-unit = 0.86, event-sequence = 0.64), coping/assurance talk (time-unit = 0.87, event-sequence = 0.67), and nonprocedural talk (time-unit = 0.85, event-sequence = 0.60) were similar. Nonverbal distraction had the lowest kappa value (time-unit = 0.79, event-sequence = 0.56).

Descriptive Analyses

Table 1 shows the number of adults displaying each behavior of interest during the analysis period. Eighty-five percent of mothers, 88% of nurses, and 67% of fathers used verbal distraction, whereas 86% of mothers, 95% of nurses, and 57% of fathers used reassurance. Criticism was shown by the least number of adults, with 2% of fathers, 7% of mothers, and no nurses using criticism. Seventeen percent of nurses, 4.8% of mothers, and no fathers used apologies during the period studied.

Overall rates of adults' use of studied behaviors during the analysis period were relatively low. Among those adults who displayed a specific behavior, rates of verbal distraction were highest. Although fewer fathers displayed studied behaviors, when behaviors were displayed, fathers used them at rates similar to those of mothers and nurses.

Correlational Analyses

Based on previous studies[17] and given that there is little theoretical basis to expect the function of behaviors to differ based on who displays the behavior, data from nurses, mothers,

Table 1. Adult Behaviors Shown in the Postanesthesia Care Unit

Behavior	Mother (n = 146)			Father (n = 134)			Nurse (n = 14, 146 observations)†		
	Number Using Behavior	Median Rate per Hour*	25th/75th Percentile	Number Using Behavior	Median Rate per Hour*	25th/75th Percentile	Number Using Behavior	Median Rate per Hour*	25th/75th Percentile
Apology	7	3.84	3.67/5.66	0	n/a	n/a	25	4.2	3.90/8.08
Coping/assurance talk	63	5.54	3.96/16.21	32	4.28	3.95/7.83	63	4.16	3.71/8.27
Criticism	11	4.10	2.86/6.12	3	3.63	1.99/5.72	0	n/a	n/a
Empathy	49	4.60	4.01/10.92	22	4.20	3.90/11.32	47	4.11	3.87/10.20
Nonprocedural talk	68	5.70	3.87/11.72	17	4.02	3.90/11.32	53	8.06	4.00/16.46
Reassurance	125	15.63	5.91/36.78	77	8.17	3.93/20.76	138	16.84	7.91/32.80
Verbal distraction	124	19.47	7.54/36.30	90	16.34	4.5/31.20	129	15.09	7.28/26.89
Nonverbal distraction	80	7.89	3.88/18.55	57	8.20	3.95/18.39	9	4.0	3.53/4.08

* Median of those displaying behavior, †Nurses may have been observed more than once.
n/a = not applicable.

Table 2. Partial Correlations between Adult and Child Behaviors

Adult Behavior	Child Behavior				
	Verbal Distress (*e.g.*, verbalizing pain or fear)	Nonverbal Distress (*e.g.*, crying, physical resistance)	Nonverbal Distraction	Verbal Distraction	Nonprocedural Talk
Verbal distraction	0.26*	0.39*	0.28*	0.50*	−0.05
Reassurance	0.49*	0.57*	−0.03	0.02	−0.04
Empathy	0.49*	0.53*	0.03	0.19	−0.05
Coping/assurance talk	0.53*	0.30*	0.10	0.03	0.09
Nonprocedural talk	−0.02	0.01	0.18	0.21	0.72*
Nonverbal distraction	−0.05	0.14	0.54*	0.21	−0.10
Apologies	0.14	0.19	0.11	0.12	0.11
Criticism	0.11	0.14	-0.12	−0.04	−0.07

The first two columns represent negative child behaviors, and the remaining three columns represent positive child behaviors. Correlations shown are partial correlations controlling for previous surgery (yes/no), child age, and type of procedure (painful/not painful).

* Correlation significant at the $P < 0.001$ level.

and fathers were combined for analyses and will be referred to here as adults. Given the heterogeneity in our sample, partial correlations are reported here controlling for child age, previous surgery (yes/no), and type of procedure (painful/ nonpainful). A Bonferroni-corrected value of $P = 0.001$ was used to correct for familywise error.

Results of partial correlations are shown in table 2. Results indicated that adults' use of verbal distraction was positively correlated with child distraction but was also positively correlated with child distress. Adults' use of reassurance, empathy, and coping/assurance talk was significantly positively correlated with children's distress and was not significantly correlated with children's distraction or nonprocedural talk. Adults' use of nonprocedural talk was significantly positively correlated with children's nonprocedural talk, and adults' use of nonverbal distraction was significantly positively correlated with children's

nonverbal distraction. Adults' use of apologies and criticism was not related to children's distress, distraction, or nonprocedural talk. All of these analyses controlled for child age, previous surgery, and type of procedure. Of note, correlations not controlling for these variables showed the same pattern of results.

Time-window Sequential Analyses

As noted previously, time-window sequential analysis examines the temporal relations between behaviors. The first set of analyses examined the likelihood that children would start to display a distress or nondistress behavior within 5 s of an adult behavior.

Results displayed in table 3 show similarly strong relations between adult and child behaviors but, in many cases, in directions opposite to those found in correlations. A significant proportion of children were less likely to verbalize

Table 3. Sequential Analysis of Children Who Are Starting to Distress and Adaptive Behaviors following Adult Behaviors

Adult Behavior	Child Behavior (Mean Yule's Q)				
	Verbal Distress	Start Nonverbal Distress	Start Nonverbal Distraction	Verbal Distraction	Nonprocedural Talk
Cope/assurance talk	−0.59* (n = 72)	−0.57* (n = 42)	—	—	—
Empathy	−0.53* (n = 66)	−0.69* (n = 41)	—	—	—
Reassurance	−0.08 (n = 92)	−0.04 (n = 49)	—	—	—
Verbal distraction	−0.86* (n = 74)	−0.25 (n = 50)	−0.39 (n = 66)	0.50* (n = 26)	—
Nonverbal distraction	—	—	−0.42 (n = 67)	—	—
Nonprocedural talk	—	—	—	—	0.98* (n = 7)

Yule's Q represents the likelihood that the child behavior will follow the adult behavior within 5 s. Yule's Q ranges from −1 to 1 (much like a correlation coefficient); positive values indicate that the child behavior is **more** likely to follow the adult behavior than any other time, whereas negative values indicate that the child behavior is **less** likely to follow the adult behavior than at any other time. Because Yule's Q values were not normally distributed, binomial tests were conducted to determine whether the distribution of positive and negative Yule's Q values in the sample were significantly different from that expected by chance.

* Significant binomial tests at $P < 0.001$. Participants must have displayed the child and adult behavior of interest to receive a Yule's Q score; therefore, sample sizes are different for each analysis.

Table 4. Sequential Analysis of Adult Behaviors during Children's Nonverbal Behaviors

Adult Behavior	Child Behavior (Mean Yule's Q)	
	During Nonverbal Distress	During Nonverbal Distraction
Cope/assurance talk	0.26 (n = 26)	—
Empathy	0.54* (n = 15)	—
Reassurance	0.47* (n = 97)	—
Verbal distraction	–0.34* (n = 81)	–0.14 (n = 92)
Nonverbal distraction	—	0.69* (n = 82)

Yule's Q represents the likelihood that the child behavior will follow the adult behavior within 5 s. Yule's Q ranges from –1 to 1 (much like a correlation coefficient); positive values indicate that the child behavior is **more** likely to follow the adult behavior than any other time, whereas negative values indicate that the child behavior is **less** likely to follow the adult behavior than at any other time. Because Yule's Q values were not normally distributed, binomial tests were conducted to determine whether the distribution of positive and negative Yule's Q values in the sample were significantly different from that expected by chance.
*Significant binomial tests at $P < 0.001$. Participants must have displayed the child and adult behavior of interest to receive a Yule's Q score; therefore, sample sizes are different for each analysis.

distress following adult coping/assurance talk, empathy, and verbal distraction than they were at any other time. Similarly, a significant proportion of children were less likely to begin to display nonverbal distress following adult coping/assurance talk and empathy than at any other time (table 3). In other words, adult use of coping/assurance talk, empathy, and verbal distraction reduced the likelihood that children would verbalize distress or become nonverbally distressed (*e.g.*, cry).

As predicted, a significant proportion of children were more likely to engage in verbal distraction following adult distraction and engage in nonprocedural talk following adult nonprocedural talk than at any other time. Children were not found to be more likely to verbalize distress or begin to display nonverbal distress following reassurance.

A second set of sequential analyses was used to further examine behaviors in the context of starting or ongoing behaviors. That is, whereas previously described analyses examined children starting to display nonverbal distress or starting to engage in nonverbal distraction, this set of analyses looked at adults' behaviors while children were already displaying these behaviors. These analyses were generally consistent with correlational findings (table 4). As expected, a significant proportion of adults were more likely to display reassurance while a child was displaying nonverbal distress than at any other time. Similarly, adult nonverbal distraction was more likely to occur while a child was engaged in nonverbal distraction.

Discussion

Under the conditions of this study, we demonstrated that not only was there a relationship between adult and child behaviors in the postoperative period but that, in some cases, adult behaviors cued the onset of children's behaviors. Adults' use of distraction and coping/assurance talk seems to keep children from becoming distressed. Reassurance and empathy do not seem to be as harmful as earlier thought if children are calm; however, if children are distressed, these behaviors seem to keep them from calming down. Not surprisingly, children tend to follow adults' lead in using coping behaviors; children were more likely to display coping behavior (*e.g.*, distraction, nonprocedural talk) after an adult used this behavior. Although previous studies have examined correlations between adult and child behaviors,[9,17,21] this is the first study of its kind to examine how adults' and children's behavior influence each other over time in the perioperative period.

The findings of this study have both clinical and methodologic implications. In terms of methodologic contributions, it is important to note that our results were somewhat different between correlational and sequential findings. For example, although most correlational findings in this study were generally in line with hypotheses generated from previous literature on children's procedural pain,[21,25,32–34] some findings were contradictory. For example, adults' uses of verbal distraction and coping talk were positively correlated with children's distress in this study, but previous literature regarding pediatric pain suggests that these behaviors are "coping promoting." Because our findings are correlational, it is impossible to conclude whether these results are reflective of adults' behavior promoting children's distress, children's distress cueing adults to try to help with distraction, or some other third variable accounting for the effect. This is an important distinction for clinical recommendations. One interpretation would suggest that adults should refrain from using distraction, whereas the other would simply describe what adults do in response to children's distress. In this study, sequential analysis helped to explain why distraction and coping talk have been previously referred to as "coping promoting." Despite positive correlations, when we looked at how behaviors were related in time, we found that children were less likely to become distressed following adults' use of distraction and coping talk than they were at any other time. This suggests that these behaviors may indeed be distress reducing.

In terms of clinical recommendations, this study also adds to the literature. Although reassurance and empathy have previously been termed "distress promoting,"[23,24,33] our sequential analyses found that this was only the case if children were already distressed. In fact, when children are calm, adults using empathy seemed to buffer them from becoming distressed. Previous studies have suggested that adults should stop using reassurance and empathic comments

during painful procedures, but we suggest that these behaviors are not necessarily harmful and may even be helpful if used skillfully.

This study adds to the previously published data from the Behavioral Interaction-Perioperative Study[9,21] in several ways. Although some of the previous results were consistent with the ones reported here (*e.g.*, nonprocedural talk appears to be adaptive and reassurance appears not to be adaptive), there were different adult behaviors used in these settings. For example, the behavior of medical reinterpretation (*e.g.*, reinterpreting medical equipment as less threatening/fun) was used commonly preoperatively and was effective in increasing children's coping if used in the operating room.[9] This behavior was not used postoperatively, but distraction *via* videos and toys was commonly used in the postoperative setting. Because of the differences in behaviors exhibited in these settings, it was important to develop separate coding schemes that were representative of the postoperative context.[22]

Several methodologic limitations with the current study should be mentioned. First, although we were able to identify important temporal relationships between adult behaviors and children's nondistress and distress behaviors, these findings are still sequential-correlational in nature. Consequently, causation cannot be inferred with respect to these findings. However, given the findings from experimental studies on reassurance and pain,[25] it is likely that the finding that reassurance elicits children's distress is plausible. It is also important to note that although in some cases sequential analyses did not yield significant results (*e.g.*, reassurance), these analyses do not consider the larger dynamic of parent–child interactions. Although not significant at a microcoding level, the correlation between reassurance and distress may be indicative of an overall pattern in interactions between parents and children. Second, the study did not examine how certain personal characteristics (*e.g.*, age, temperament, previous surgical experience) or relational characteristics (*e.g.*, parent–child relationship) can moderate the relationship between adult behaviors and children's distress and nondistress behaviors. Presumably, parent–child relationships that are characterized by warmth and support may allow for a child to be soothed more easily than a relationship characterized by a lack of warmth and support. Future studies should examine potential moderators to these observed adult–child relationships in the PACU. Third, there was a relatively substantial number of potential participants who declined participation. We have limited data on these potential participants, but some of the reasons provided (*e.g.*, too stressed) suggest that we may have had some bias in sample selection. We also do not have data on the influences of other children in the PACU; it is possible that witnessing another child in distress may affect children as much, if not more, than adults. It is also possible that other nonverbal behaviors not coded here could influence results. Future

research should consider child–child interactions in the PACU. In addition, future studies should examine the causal nature of these relationships by experimentally manipulating these behaviors in their studies.

In conclusion, the present study examines the temporal relationship of adult and child behaviors in the PACU using two methodologies. Adult behaviors were related to the onset of children's distress and coping behaviors, and the function of these behaviors differ depending on whether children were already distressed. Future studies should design interventions to teach adults to increase desirable and decrease undesirable behaviors. These studies will be doubly beneficial—they will support the validity of conclusions reached *via* sequential analysis and they will establish an evidence-based intervention to decrease children's distress. Notably, adults relatively infrequently used behaviors that were found to cue children's coping and therefore should be encouraged through intervention to be more interactive in the PACU. Learning more about influences on children's distress in the immediate perioperative period may also have implications for later recovery; behavioral patterns shown in the PACU may be indicative of patterns that will also be shown at home. In sum, adult behaviors represent important leverage points that can aid in the reduction of children's distress and promote their coping and should be an important consideration in the perioperative period.

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Appendix: Adult Behavior Codes and Operational Definitions

Code	Definition
Verbal codes	
Apologies	Any statement to child relating a sense of sorrow or a sense of responsibility for the procedure.
Cope/assurance talk	Talk about or instructions to engage in coping behavior (other than distraction). Also includes assurance comments that make tangible suggestions that the child's state will improve "if" they do a stated behavior.
Criticism	A direct or indirect negative evaluation that expresses judgment of a behavior, which may include hostility.
Empathy	Statements to the parent or child that express understanding of or identification with their feelings.
Verbal engage in distraction	Comments that direct attention toward or refer to objects of distraction (e.g., talking about the TV show, book, toys).
Nonprocedural talk	Any conversation or statements pertaining to activities outside the surgery center. Distracting with talk rather than by directing attention toward an object.
Reassurance	Any statement that seeks to improve the child's emotional state.
Nonverbal codes	
Nonverbal distraction	Adult is engaged in activities that can distract child from their situation (e.g., watching TV, reading books, playing games).