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Perspectives of Parents and Anesthesia Providers on Minor Undesirable Adverse Events in Pediatric Anesthesia

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Background: Decreasing the incidence of minor adverse events improves parental satisfaction in pediatric anesthesia. Previous studies have ranked these adverse events from only one perspective (either parents' or anesthesia personnel's).
Objectives: This study was designed to determine the participants' rankings of minor adverse events and compare them among parents and anesthesia providers. This study also investigated the correlations between the care priorities and their previous anesthesia experiences.
Methods: We conducted a single-center, prospective study on 156 participants. Questionnaires were administered to three groups: Parent group (n, 101), Anesthesiologist group (n, 37), and Postanesthesia care unit nurse (PACU-nurse) group (n, 18). The respondents ranked seven predefined minor adverse events from the most undesirable ("1") to the least undesirable ("7"). Details of previous anesthesia experiences of themselves and their children were also collected.
Results: For the parents, the most important to avoid was pain (average ranking, 2). Whereas the anesthesiologists and PACU-nurses focused more on postoperative behavioral change (average ranking, 1). Sixty-eight percent of the parents with prior postoperative pain rated pain as the most undesirable side effect for their children (OR 3.6 [1.2-11.4]; *P*=0.027).
Conclusions: There was a divergence between the parents' and the anesthesia personnel's views on the minor anesthesia adverse events to avoid. The parents' priorities for their children's anesthetic care were influenced by their previous experiences, especially those with prior postoperative pain. To improve parental satisfaction, anesthesia providers should know which are the parental expectations and preferences.
Keywords: adverse event, parental preferences, pediatric anesthesia, pediatric surgery, postoperative pain

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Due to the advancements in anesthetic techniques, the incidence of morbidity and mortality during pediatric anesthesia is decreasing remarkably. The acceptance of serious outcomes has declined.[1] While it is known that the risks in pediatric anesthesia are strongly associated with patients' characteristics[2] which are unmodifiable, there remains room for improvement in the quality of pediatric anesthesia. Some studies have reported that efforts to prevent and treat frequent but non-life-threatening adverse outcomes have led to enhancing patients' and parental satisfaction level.[1,3]

Several studies have investigated parental impressions of minor adverse anesthesia events in the pediatric population. Wagner et al.[4] reported that, for the parents, the most undesirable adverse event was vomiting, followed by surgical pain and nausea. However, another study showed that parental dissatisfaction after anesthesia care has been found to be most strongly associated with postoperative behavioral disturbance.[5] We therefore cannot conclude which minor adverse anesthesia events are the most to be avoided from the parents' point of view. One study

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found that anesthesiologists deemed the adverse event most important to avoid was postsurgical pain, followed by nausea and vomiting.[6] Postanesthesia care unit (PACU) nurses also have an important role in postoperative care. Parental satisfaction with anesthesia care has been consistently associated with the quality of PACU care.[7,8]

Past publications have helped to improve practitioner awareness of the dissimilarities between the preferences of the parents and anesthesia personnel. However, a study directly focusing on, and comparing, the perspectives of these groups has not been performed. We hypothesized that there are discrepancies between the perspectives of parents, anesthesiologists, and PACU-nurses as to which are the most undesirable minor adverse anesthesia events to be avoided. We predicted that the experiences of minor adverse events either by themselves or by their child would influence how they ranked the events they wanted their children or patients not to suffer from. The objective of this study was to determine the participants' rankings of minor adverse events and also investigated the correlations between the various responses and their prior anesthetic experiences.

Methods

The study was conducted in a tertiary academic hospital, Siriraj Hospital, Bangkok, Thailand. The approval was granted by the Ethics Committee on Human Research of the Faculty of Medicine, Siriraj Hospital in September 2019 (SI615/2019).

Definition of target group

The inclusion criteria for each group were as described below.

1. *Parent group:* Parents of children aged 1-15 years who were undergoing surgery under general anesthesia from October 2019 to March 2020 at Siriraj hospital. Thai-language ability.

2. *Anesthesiologist group:* Anesthesiologists with at least one year's experience in pediatric anesthesia.

3. *PACU-nurse group:* Nurses with at least one year's experience in taking care of pediatric surgical patients in the PACU.

The exclusion criterion was refusal to respond.

Questionnaire development and distribution

We identified common adverse outcomes and minor adverse events by a computerized literature search from the MEDLINE database through PubMed using the term, "pediatric anesthesia outcomes, complications." The resultant list of possible adverse outcomes such as death, recall, nerve injury, dental or lip injury, corneal abrasion, nausea and vomiting, pain, residual weakness, anxiety, urinary retention, postoperative behavioral change, gagging on endotracheal tube, shivering, pruritis, sore throat, hoarseness, and somnolence[1-3,5,9-14] was analyzed by the authors (which consisted of four anesthesiologists, two of them are board-certified pediatric anesthesiologists and two of them are general anesthesiologists). Not all of these outcomes were included in the questionnaire. The choice of outcomes was based on their prevalence, the degree of importance of avoiding them, and their potential to affect satisfaction. The seven outcomes that were selected for incorporation in the questionnaire were hoarseness, sore throat, nausea, vomiting, postsurgical pain, drowsiness, and behavioral change. All outcomes were defined with short descriptions providing in the questionnaires.

The questionnaires were divided into (1) general demographic data (age, sex, education, income, work history, type of surgery, and inpatient or outpatient surgery); (2) previous experiences with anesthesia adverse events of themselves or their child; and (3) rankings. The participants were asked to rank 7 adverse anesthesia outcomes from the most undesirable ("1") to the least undesirable ("7"). The questionnaires were reviewed by 3 anesthesiologists (not the same individuals who assessed the importance of the included outcomes). The language and comprehensibility were then reevaluated and revised by 2 nonmedical personnel.

The parents of the pediatric patients were personally approached by the same research personnel who was a general anesthesiologist staff. A brief description of the study was given to the parents along with a letter explaining the purpose of the study, a questionnaire

that contained no identifying information, and a consent form. For inpatients, we recruited the parents on the ward the day before surgery. We asked the parents to complete the questionnaires and return them to the ward nurse's station before the surgery. For ambulatory patients, we recruited the parents in the waiting area on the day of surgery. The parents were requested to return their completed questionnaires to the nurse's station or a collection box before leaving PACU. The envelopes were collected once a week.

For anesthesiologist and PACU-nurse groups, the questionnaires were distributed by electronic mail to personnel meeting the inclusion criteria. To increase the response rate, follow-up emails were sent twice (after 2 weeks and 1 month).

The questionnaires with incomplete data especially in the rankings section were excluded from the analyses.

Sample size calculation

Our study aimed to compare the perspectives on minor anesthesia adverse events among three groups. We designed to use the average rank (estimated means) of each adverse event for comparing their preferences. To establish an accurate ranking for each event, the sample size of the parent group was calculated by confidence interval for mean based on the standard normal distribution (n large) using nQuery Advisor (version 6.0; Statistical Solutions Ltd., Cork, Ireland). The work of Macario et al. on undesirable adverse anesthesia events in adult patients showed the mean average ranks and standard deviations of undesirable anesthesia outcomes.[15] We calculated the sample size from the largest SD value of interested events, which was postoperative pain (SD, 0.2). With 95% confidence interval, and a distance from mean to limit of 0.04, the sample size of the parent group was calculated to be 97. After allowing for a 30% dropout, a total of 127 questionnaires were distributed for the parent group. The sample sizes of the anesthesiologist and PACU-nurse groups were limited by the number of personnel at Siriraj Hospital.

Statistical analysis

The statistical analyses were performed with PASW Statistics for Windows (version 18.0; SPSS Inc., Chicago, Ill., USA). Descriptive statistics were used for the respondent characteristics and rankings. Data are presented as frequencies, percentages (%), mean±SD (for data with normal distribution), or median with interquartile range (for data with abnormal distribution), as appropriate. The association between the most undesirable anesthesia adverse events and the previous anesthesia experiences of the respondents and/or their child was reported by odds ratio, 95% confidence intervals, and *P*-value using binary logistic regression.

Results

Demographic data

Parent group

The response rate was 86.6% (110 out of 127 parents), with 101 (79.5%) completing the questionnaire without any missing information. Most of the respondents were mothers. (Table 1)

Table 1 Demographic characteristics of parents and pediatric surgical patients

Characteristics	Parent group (N=101)
Relationship	
Mother	80 (79.2%)
Father	16 (15.8%)
Other	5 (5.0%)
Age of parents (years)	
< 20	1 (1.0%)
20-29	23 (22.8%)
30-39	43 (42.6%)
40-49	27 (26.7%)
> 50	7 (6.9%)
Education of parents	
Primary school or less	9 (8.9%)
High school	41 (40.6%)
Bachelor degree or higher	51 (50.5%)
Household income per month (Thai Baht)	
< 20,000	48 (47.5%)
20,001-50,000	37 (36.6%)
50,001-100,000	12 (11.9%)
> 100,000	4 (4.0%)
Number of children	
One	47 (46.5%)
Two	39 (38.6%)
> two	15 (14.9%)

Table 1 Demographic characteristics of parents and pediatric surgical patients (cont.)

Characteristics	Parent group (N=101)
Age of patients (years)	
1-3	44 (43.6%)
4-6	29 (28.6%)
7-9	24 (23.8%)
10-15	4 (4.0%)
Type of surgery planned	
General	30 (29.7%)
Otolaryngologic	21 (20.8%)
Urologic	20 (19.8%)
Orthopedic	10 (9.9%)
Plastic surgery	8 (7.9%)
Ophthalmologic	4 (4.0%)
Other	8 (7.9%)
Admission type	
Ambulatory surgery	12 (11.8%)
In-hospital patient	83 (82.2%)
Postoperative admission	6 (6.0%)
Prior parental experience of surgery	
Yes	54 (53.5%)
Had at least one anesthesia adverse event	
Yes	38 (70.4%)
Prior pediatric-patient experience of surgery	
Yes	58 (57.4%)

Values are expressed as number (%)

Anesthesiologist group

In all, 60 questionnaires were distributed to anesthesiology staff at Siriraj Hospital. Their response rate was 68.3% (n, 41); excluding the questionnaires with incomplete information, 37 responses were available for analysis. The large majority (78.4%) were female. Only 16.2% of the respondents had certified specialty training in pediatric anesthesia; nevertheless, virtually all of the anesthesiology staff at our institution had to provide anesthesia to children. (Table 2)

PACU-nurse group

Eighteen out of thirty questionnaires were sent back (return rate, 60%). The majority of the respondents were the younger PACU-nurses. All respondents were female. (Table 2)

Table 2 Demographic characteristics of anesthesiologists and PACU-nurses

Characteristics	Anesthesiologist group (N=37)	PACU-nurse group (N=18)
Sex		
Female	29 (78.4%)	18 (100%)
Age (years)		
20-29	1 (2.7%)	10 (55.6%)
30-39	25 (67.6%)	5 (27.8%)
40-49	7 (18.9%)	1 (5.6%)
> 50	4 (10.8%)	2 (11.1%)
Years of experience		
1-2	3 (8.1%)	1 (5.6%)
3-5	10 (27.0%)	4 (22.2%)
6-10	11 (29.7%)	5 (27.8%)
11-20	9 (24.3%)	7 (38.9%)
> 20	4 (10.8%)	1 (5.6%)
Have Children		
Yes	6 (16.2%)	5 (27.8%)
Prior experience of surgery		
Yes	20 (54.1%)	5 (27.8%)
Had at least one anesthesia adverse event		
Yes	9 (45%)	4 (80%)
Prior experience of surgery for their children		
Yes	2 (5.4%)	5 (27.8%)

Abbreviation: PACU, postanesthesia care unit, Values are expressed as number (%)

Rankings results

There was a difference among the three groups in terms of the most significant anesthesia side effect to avoid. For the parents, the most important to avoid (the top rank) was postsurgical pain. The anesthesiologists and PACU-nurses ranked postoperative behavioral change as the most undesirable side effect for their patients. (Figure 1) The average rankings of the top 3 undesirable adverse events of the groups are summarized in Table 3.

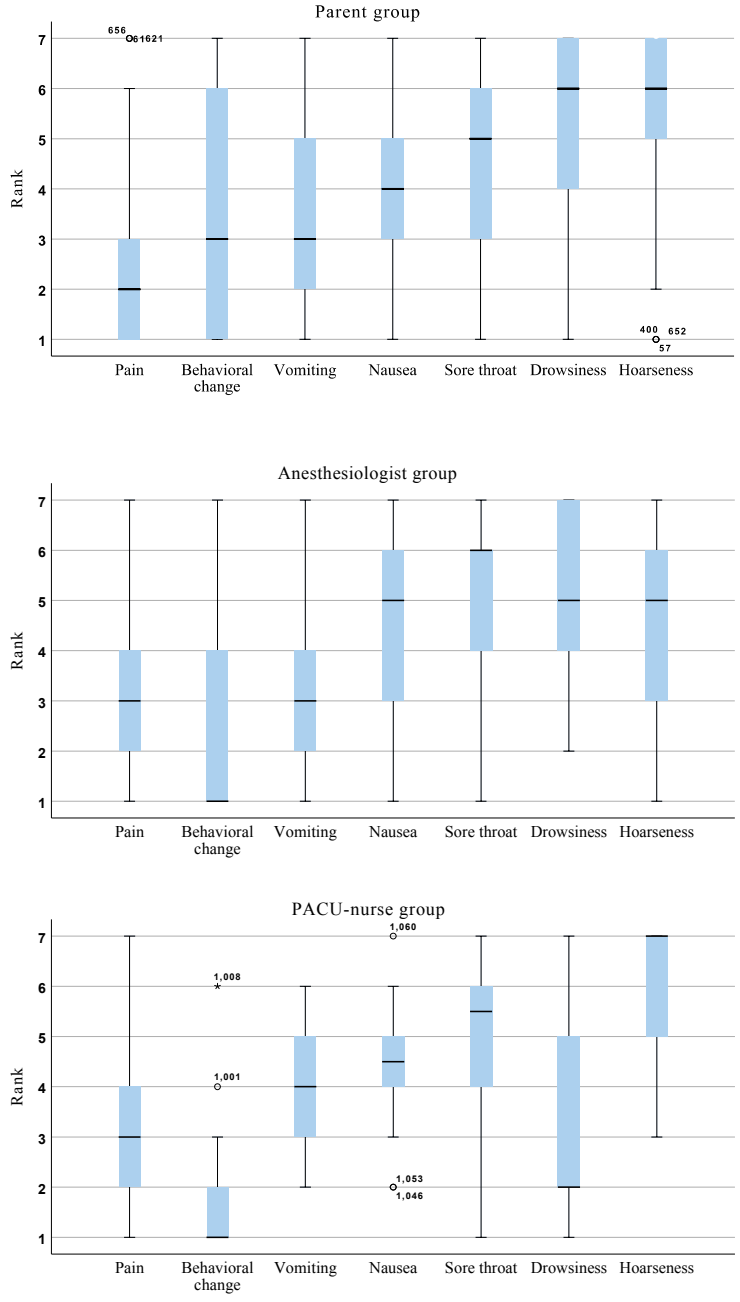


Figure 1 displays the rankings of each undesirable adverse anesthesia event, separating into data for the parent, anesthesiologist, and PACU-nurse groups. The boxplot shows median, interquartile range, and min-max.
1, “the most undesirable”, to 7, “the least undesirable”

Table 3 Top-three rankings of undesirable anesthesia side effects by parent, anesthesiologist, and PACU-nurse groups

Top-three rankings	Rank
Parent group	
1. Postoperative pain	2 (1, 3)
2. Behavioral change	3 (1, 6)
3. Vomiting	3 (2, 5)
Anesthesiologist group	
1. Behavioral change	1 (1, 4)
2. Postoperative pain	3 (2, 4)
3. Vomiting	3 (2, 4.5)
PACU-nurse group	
1. Behavioral change	1 (1, 2.25)
2. Drowsiness	2 (2, 5.25)
3. Pain	3 (2, 4.5)

Abbreviation: PACU, postanesthesia care unit

Data are expressed as median (P25, P75)

Half of the respondents (50.6%) from all groups had had surgery in the past. Two-thirds (64.6%) of their past surgical experiences involved one or more anesthesia side effects. The relationship between the past experiences of anesthesia and the undesirable adverse events in the parent group is demonstrated in Table 4. Interestingly, as many as 68.8% of the parents who had previously experienced postsurgical pain rated pain as the most undesirable side effect for their children. In contrast, only 37.6% of parents who had no prior experience of postoperative pain gave it the top rank (OR 3.6 [1.2-11.4]; *P*=0.027). Postoperative behavioral change was ranked first by 66.7% of parents whose child had a history of this event (OR 4.1 [0.4-47.2]; *P*=0.254). No relationship between past experiences of other adverse events and the ranking of the outcomes was found. As to the anesthesiologist and PACU-nurse groups, we could not analyze for correlations given the small participant numbers for personal experience of surgery and children with a history of surgery.

Table 4 Previous anesthesia experience and the most undesirable anesthesia adverse events in the parent group

	Rated this adverse event as the top rank			
	Yes	No	OR (95% CI)	*P*-value
Postoperative pain				
Had a history of postoperative pain				
Yes	11 (68.8%)	5 (31.3%)	3.6 (1.2-11.4)	0.027*
No	32 (37.6%)	53 (62.4%)		
Their child had a history of postoperative pain				
Yes	6 (50%)	6 (50%)	1.4 (0.4-4.7)	0.581
No	37 (41.6%)	52 (58.4%)		
Postoperative behavioral change				
Their child had a history of behavioral change				
Yes	2 (66.7%)	1 (33.3%)	4.1 (0.4-47.2)	0.254
No	32 (32.7%)	66 (67.3%)		
Vomiting				
Had a history of vomiting				
Yes	1 (10%)	9 (90%)	0.9 (0.1-7.9)	0.924
No	10 (11%)	81 (89%)		
Their child had a history of vomiting				
Yes	1 (16.7%)	5 (83.3%)	1.7 (0.2-16)	0.643
No	10 (10.5%)	85 (89.5%)		

Data presented as number (%), * statistically significant, Abbreviation: PACU, postanesthesia care unit

Discussion

When exploring which pediatric anesthesia minor adverse events were the most important to avoid, we found that the parents of pediatric surgical patients ranked postsurgical pain first. The other items, in descending order, were behavioral change, vomiting, nausea, sore throat, drowsiness, and hoarseness. The anesthesiologists and PACU-nurses chose postoperative behavioral change as the most undesirable outcome. This finding confirms our hypothesis that there was a difference between the perspectives of parents and anesthetic personnel.

Inadequate pain management is still a serious problem, especially in children. This problem has been demonstrated to contribute to negative parental satisfaction.[5,16] As anticipated, the parents in our study ranked pain as the top adverse event to be avoided. However, both the anesthesiologists and the PACU-nurses rated pain as the second most undesirable event. Our study emphasizes the need for practitioners to be more focused on the provision of adequate postoperative pain control in order to better meet parents' expectations.

Children may develop postoperative behavioral change following surgical procedures.[13,17] These symptoms can appear anytime from immediately postoperatively to postoperative day 30, and they are associated with low parental satisfaction.[5] From our study, postoperative behavioral change was rated as the most preferred event to be avoided by both the anesthesiologists and PACU-nurses. In contrast, the parents ranked it as the second most preferred adverse event to be avoided. As we tried to standardize the definition of postoperative behavioral change in this study by adding the same description in the questionnaire for all groups, we suspected that the anesthesiologists and PACU-nurses considered this problem as emergence delirium while parents might consider this term as actual behavioral changes at home after surgery. This could partly explain the different responses. Another explanation is the parents may have not been properly advised about this complication. Crying or tantrums may be perceived as normal after procedures, especially among parents who have had no prior experience with this problem. The information presented may not adequately highlight that postoperative behavioral changes could be displayed by their children. Thus, better counseling may help to improve the understanding of the parents.

Vomiting was ranked as the third most undesirable adverse event by parents and anesthesiologists. This contrasts with the finding by Wagner et al. that most parents regarded vomiting as worse than pain.[4] Our study showed that, the parents and medical personnel perceived postoperative nausea and vomiting (PONV) to be not as undesirable as pain. The incidence of PONV has been reported to be quite high (33.2%-82%).[11] However, a study on the adult population in Thailand showed a significantly lower incidence and intensity of emesis than for the population in a western country.[18] Children are prone to illness and motion sickness that can precipitate nausea and vomiting. As such, the sight of a child vomiting is not as distressing to a parent as observing pain in the same individual.[19] It is also possible that postoperative vomiting occurred quite frequently so the parents consider this as a usual incidence. These could explain why both the parents and the anesthesia personnel in our study considered PONV to be less troublesome than the past studies.

Drowsiness of the children during the postoperative period may lead to a delayed discharge. Moreover, airway and respiratory complications could occur in patients who have been over sedated. This could be a concern for the PACU-nurses who take care of patients in the recovery room. The PACU-nurses ranked drowsiness as the second most undesirable side effect. In the study by Sikich et al., 93% of parents expected their child to be sleepy after surgery and would not be upset if their child's discharge was delayed by up to 3 hours.[16] The findings of that research were consistent with our study, in which the parents ranked postoperative drowsiness as the sixth of the seven undesirable adverse anesthesia events. These results suggest that rapid recovery from anesthesia and prompt discharge

from the recovery room may not be a key expectation of the parents. However, the major population of our pediatric patients was inpatients whom the delay in discharging from the PACU may not their priority because they are not going home. We believe that this issue may affect the result of our study. Further study focusing on the ambulatory population may be advantageous.

From the result of our study (Table 3 and Figure 1), although some median values were the same across the groups, there was a large variation in the responses for each item in each group. The explanation is this study aimed to explore the preferences of the respondents. Since the preferences were highly subjective, individuals who had diverse answers from the median of their group may have personal reasons such as their experiences, their beliefs, or knowledge. In this study, we did not explore to one with disparity answers.

We hypothesized that past anesthesia adverse events could affect how parents would respond to the undesirable adverse outcomes. Our analysis found that 68% of the parents who had a personal prior experience of pain following surgery rated pain as the most undesirable side effect for their children (OR 3.6 [1.2-11.4]; *P*=0.027). This implies that pain is the most distressing side effect for patients, and it suggests that anesthesiologists and PACU-nurses need to ensure that children's postoperative pain relief is adequate. Past experiences of other adverse events may not represent their most undesirable side effects. Proper inquiries about their preferences may the best way to provide the anesthesia care that suits each pediatric surgical patient and the parents.

There are some limitations to this study. Firstly, being a survey-based study, response bias may be present. A response rate approximating 60% should be the goal of the researchers.[20] In our study, the possibility of response bias was reduced due to all groups having a response rate of 60% or higher. However, a majority of the respondents for all groups were female. The gender bias may somehow affect the result of our study. For a further investigation, expansion to a multicenter study to increase the variety of patients as well as personnel's characteristics would reduce this bias. Secondly, the preliminary choices of undesirable anesthesia adverse events in the questionnaire were systematically selected by the group of four anesthesiologists. However, this could be the source of bias. For a future study, recruiting non-anesthetic providers for the questionnaire development or adding the blank space in the questionnaire to fill up would decrease this limitation. Lastly, in the parent group, there was a variation in the information given to the parents about the anesthetic care and complications. We attempted to manage this bias by having only one researcher approach the parents and give a short description of the seven adverse anesthesia events in the questionnaire to ensure a good understanding. However, before the completion of the questionnaires, other information given to the parents by the anesthesiologist, nurse, or surgeon was sometimes different and may have influenced their answers.

Conclusion

Despite its limitations, this study demonstrated that there was a mismatch of the parents' and anesthetic personnel's views of the minor adverse events to avoid. Avoiding pain seemed to be a high priority for most parents, especially those who had prior personal experience with postoperative pain. By comparison, anesthesia personnel were more focused on postoperative behavioral changes, which are also important complications. This could lead to a discrepancy in target intervention. In order to improve parents' satisfaction with pediatric anesthesia, being aware of their expectations and preferences for avoiding anesthesia side effects is necessary. This study suggests that preoperative parental assessments by anesthesiologists may guide them in the selection of anesthesia and techniques.

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