Pharmacological and non-pharmacological interventions to alleviate anxiety before pediatric anesthesia: a survey of current practice in Korea

Hyo Eun Kang, Sung Mee Jung, and Sungsik Park*

部门 of Anesthesiology and Pain Medicine, Yeungnam University School of Medicine, *Kyungpook National University School of Medicine, Daegu, Korea

Background: This study was undertaken to determine current practice for preoperative anxiety reduction in Korean children.

Methods: An email survey of all members (n = 158) of the Korean Society of Pediatric Anesthesiologists was conducted from November 2014 to January 2015 to assess current practice, preferences, and general opinions regarding pharmacological and non-pharmacological interventions performed to alleviate preoperative anxiety in children prior to general anesthesia.

Results: Forty-one anesthesiologists completed the survey; a response rate of 26%. Only 4.9% of respondents undertook anxiety reduction according to a written hospital policy, and 95.1% did not. Most respondents (70.7%) performed anxiolytic intervention guided by informally standardized hospital protocol. In clinical practice, 90% of respondents used pharmacological and/or non-pharmacological intervention to alleviate anxiety in children. Nearly half of the respondents (53.7%) used premedication to reduce anxiety, and midazolam was most frequently used. Parental presence during induction of anesthesia was considered the most effective non-pharmacological intervention (60.4%), and was allowed by 78% of respondents, and watching a video was considered the second most effective intervention (27.1%).

Conclusions: Korean pediatric anesthesiologists use both pharmacological and non-pharmacological interventions to alleviate anxiety, and these interventions are generally guided by an informally standardized hospital protocol. Anesthesiologists requiring effective anxiety reduction prefer pharmacological intervention and most frequently use parental presence during induction of anesthesia. (Anesth Pain Med 2016; 11: 55-63)

Key Words: Anesthesia, Anxiety, Pediatrics, Policy, Premedication, Preoperative period.

INTRODUCTION

A significant number of young children undergoing general anesthesia experience high levels of preoperative anxiety caused by separation from parents, exposure to an unfamiliar environment, or fear of the surgical procedure. Because preoperative anxiety can complicate the induction of anesthesia and develop negative postoperative behavior [1,2], pediatric anesthesiologists generally use a variety of interventions to reduce preoperative anxiety in children. Surveys conducted in different countries have documented the frequencies of and the reasons for anxiolytic interventions in pediatric patients [3-7]. However, no such study has been previously conducted in Korea. In addition, practices have changed over decades due to the introductions of short-acting anesthetics with fewer side effects, advances in distraction technology, and the increasing trend toward parental presence during induction of anesthesia (PPIA).

The aims of this study were to document current practice and general opinions regarding pharmacological and non-pharmacological interventions for alleviating preoperative anxiety in children about to undergo general anesthesia in Korea.

MATERIALS AND METHODS

An approval was obtained from our hospital Institutional Review Board for this study. After obtaining permission from the Korean Society of Pediatric Anesthesiologists (KSPA), we conducted a survey of current clinical practice, preferences, and
general opinions regarding perioperative anxiety reduction in
Korean children from November 2014 to January 2015. The
questionnaire with an explanation of this survey and its sig-
nificance was emailed to all members (n = 158) of the KSPA
in November and a reminder email was sent in December
2014 by the KSPA to ensure personal privacy. Completion of
the questionnaire by the participants was conducted on a
voluntary, anonymous basis.

The survey (Appendix 1) consisted of 1 open and 23 closed
questions in four sections (Table 1), which addressed; 1) re-
spondent demographics, 2) preferences and guidelines for
anxiolytic intervention prior to pediatric anesthesia, 3) gen-
eral opinions and practices of pharmacological intervention
for anxiety reduction, and 4) general opinions and practices of
non-pharmacological intervention for anxiety reduction.

Statistical analysis was performed using SPSS version 21.0
(IBM Corporation, New York, NY, USA). Descriptive vari-
ables are reported as means ± SDs or as medians and ranges. For
categorical variables, both single and multiple response
questions are reported as numbers (%) of all responses. The
respondent demographics were analyzed using the one sample
t-test and the chi-square test or Fisher’s exact test. Statisti-
cal significance was accepted for P values < 0.05.

## RESULTS

### Demographics of respondents

Forty-one of the 158 members of the KSPA participated in
the survey; an overall response rate of 26%. The characteris-
tics of pediatric anesthesiologists who responded to the survey are
summarized in Table 2. Respondents were typically in their
forties (39%), the gender ratio was almost 1:1 (males 46.3% and
females 53.7%), and they had been in practice for 14.4 ±
8.4 years. Most of them (85.4%) worked at tertiary hospital.
Respondents usually anesthetized inpatients (84.6%); followed
by same-day admittance patients (10.1%), and outpatients
(5.3%). The capital area (41.5%), Gyeongsang (22.0%), and
Jeolla (14.6%) were the three most common practicing regions.

### Written hospital policies for reducing anxiety prior
to anesthesia

Most respondents (95.1%) had no written hospital policy;
only 4.9% of the respondent performed reduction of child

---

### Table 1. Questionnaire Sections

| Section                                                                 | Details                                                                 |
|------------------------------------------------------------------------|------------------------------------------------------------------------|
| 1. Respondent demographics                                             | Age, gender, subspecialty, type of hospital work, practicing region.    |
| 2. Preference and guideline for anxiolytic intervention in pediatric anesthesia | Presence of a written policy, preference for pharmacological and non-pharmacological interventions and actual use in clinical practice |
| 3. General opinions and practices regarding pharmacological intervention for anxiety reduction  | Premedication regimen and route of administration, side effects of concern and those experienced, a beliefs concerning the need for routine anticholinergic use |
| 4. General opinions and practices of non-pharmacological intervention for anxiety reduction | Non-pharmacological intervention used in practice and preferred and attitude to parental presence during induction of anesthesia |

---

### Table 2. Demographics of Respondents

| Characteristics | Value          |
|-----------------|----------------|
| Age (yr)        |                |
| 31-40           | 10 (24.4)      |
| 41-50           | 16 (39.0)      |
| 51-60           | 13 (31.7)      |
| 61-70           | 2 (4.9)        |
| Gender          |                |
| Male            | 19 (46.3)      |
| Female          | 22 (53.7)      |
| Years in practice |            |
| Mean ± SD       | 14.4 ± 8.4     |
| Range           | 1–32           |
| Subspecialty training |        |
| Yes             | 21 (51.2)      |
| No              | 20 (48.8)      |
| Type of hospital |            |
| Primary         | 1 (2.4)        |
| Secondary       | 5 (12.2)       |
| Tertiary        | 35 (85.4)      |
| Number of beds  |                |
| ≤ 200           | 1 (2.4)        |
| 201–500         | 2 (4.9)        |
| 501–800         | 10 (24.4)      |
| 801–1000        | 20 (48.8)      |
| > 1000          | 8 (19.5)       |
| Type of patients (%) |         |
| Outpatients     | 5.3 ± 10.4     |
| Inpatients      | 84.6 ± 18.6    |
| Same-day admitt | 10.1 ± 13.1    |
| Practicing region |            |
| Capital region  | 17 (41.5)      |
| Gangwon         | 2 (4.9)        |
| Chungcheong     | 4 (9.6)        |
| Jeolla          | 6 (14.6)       |
| Gyeongsang      | 9 (22.0)       |
| Jeju            | 3 (7.3)        |

Values are expressed as number (%), means ± SDs or ranges.
anxiety according to a written hospital policy. Majority of respondents (70.7%) performed anxiolytic interventions according to an informally standardized hospital protocol (habitual choice generally accepted in their hospital and learned by word of mouth).

Preferences and actual practice regarding pharmacological and non-pharmacological interventions

Non-pharmacological intervention (46.3%) was preferred to premedication (39.0%) to reduce preoperatively anxiety. Small proportion of respondents (14.6%) stated they had no preference. The three most common reasons given to support preference were effectiveness (32.0%), concern about side effects (26.0%), and convenience (24.0%, Table 3). However, these reasons were found to depend on anxiolytic preferences, that is, effectiveness was favored by those who preferred pharmacological intervention, and concern about side effects was favored by those who preferred non-pharmacological intervention.

Actually used intervention for reducing anxiety in clinical practice were significantly different according to the anxiolytic preference ($P = 0.005$) but they did not consistently match each other (Table 4). Overall, non-pharmacological intervention and premedication were actually performed by 36.6 and 24.4% of the respondents, respectively, in clinical practice. Both were used by 29.3% and neither was used by 9.8% of the respondents.

Current practice and general opinions regarding pharmacological anxiolytic intervention in pediatric patients

About half of the respondents (53.7%) reported use of premedication prior to surgery as single intervention or combination with non-pharmacological intervention. However, the other respondents (46.3%) stated they were unlikely to use premedication in practice because of needlessness of premedication (42.1%), concern about side effects (31.5%) and invasiveness of administration (21.5%).

Reducing child anxiety (63.4%) and control of sympathetic activity (17.1%) were reported to be the two most important reasons for premedication. Reducing parental anxiety, pain control, and improving cooperation during induction of anesthesia tied as the third most important reasons (each 9.8%). Age limitation to premedication was applied by 39.0% of respondents. Although minimum age for premedication ranged from 1 month to 5 years, majority of respondents (68.8%) adopted a minimum age of 1 year.

Drug selection for premedication was guided by customarily use (45.1%), the literature (17.1%), and effectiveness (14.6%).

| Table 3. Reasons for Anxiolytic Intervention Preferences in Pediatric Patients |
|---------------------------------|--|--|--|--|
| | Non-pharmacological preference (n = 19) | Pharmacological preference (n = 16) | No preference (n = 6) | Overall (n = 41) |
|-----------------|-----------------|-----------------|-----------------|-----------------|
| Effectiveness   | 5 (17.9)        | 11 (68.8)       | 0               | 16 (32.0)       |
| Concern about side effect | 10 (35.7)     | 0               | 3 (50.0)        | 13 (26.0)       |
| Convenience     | 7 (25.0)        | 4 (25.0)        | 1 (16.7)        | 12 (24.0)       |
| Reduction of parental anxiety | 5 (17.9)    | 1 (6.3)         | 1 (16.7)        | 7 (14.0)        |
| Psychological stability of anesthesiologist | 1 (3.5)       | 0               | 1 (16.7)        | 2 (4.0)         |
| All responses   | 28 (100)        | 16 (100)        | 6 (100)         | 50 (100)        |

Multiple responses are possible. Values are expressed as number (%) of all responses.

| Table 4. Preference and Actual Practice of Anxiolytic Intervention in Pediatric Anesthesia |
|---------------------------------|--|--|--|--|
| Actual practice | Non-pharmacological preference (n = 19) | Pharmacological preference (n = 16) | No preference (n = 6) | Overall (n = 41) |
|-----------------|-----------------|-----------------|-----------------|-----------------|
| Non-pharmacological intervention | 12 (63.2)      | 2 (12.5)        | 1 (16.7)        | 15 (36.6)       |
| Pharmacological intervention | 1 (5.3)        | 8 (50.0)        | 1 (16.7)        | 10 (24.4)       |
| Both            | 5 (26.3)        | 4 (25.0)        | 3 (50)          | 12 (29.3)       |
| Neither         | 1 (5.3)         | 2 (12.5)        | 1 (16.7)        | 4 (9.8)         |

Values are expressed as numbers (%) of respondents.
Of all responses, the most frequently used premedication was midazolam (24.7%) followed by ketamine (20.3%) when multiple responses were allowed by the respondent (Table 5). The use of anticholinergic premedication for children undergoing surgery was considered routinely by 24.4%, occasionally by 34.1% and as unnecessary by 39.0% of the respondents. Premedication was administered in the preoperative holding area (54.7%), in the ward (24.5%), or in the operating room (20.8%). Intravenous administration was usually preferred to intramuscular administration. Children that remained anxious despite premedication were usually managed with an intravenous anesthetic (61%) or by PPIA (31.7%).

Respiratory depression was the side effect of most concern (53.7%) when considering use of premedication, and was also the most commonly experienced side effect (22.0%). Other side effects actually experienced by respondents were overexcitement (14.6%), injection pain (12.2%), delayed recovery after anesthesia (9.8%), and nausea and vomiting (2.4%). However, 20% of respondents report no adverse event after premedication.

Current practice and general opinions regarding non-pharmacological anxiolytic intervention in pediatric patients

The respondents replied that PPIA, watching a video using a hand-held electronic device, such as, a smartphone or personal computer, and conversation effectively reduced anxiety prior to surgery (Table 6). On the other hand, reading books, an operating room tour, hypnosis, and the use of clowns were reported to be ineffective.

PPIA was allowed on a case by case basis by 78% of the respondents, but was absolutely forbidden by 19.5% of them. Respondents used PPIA to prevent separation anxiety (65%), to induce volatile anesthesia smoothly (20%), and to reduce parental anxiety (15%). On the contrary, respondents forbade PPIA to maintain stability of the operating room environment (46.2%) and to prevent transmission of anxiety from parents to children (30.8%) and used premedication (75%), conversation (50%), a video viewing (50%), or a video game (12.5%) as

### Table 5. Premedication of Pediatric Patients before Elective Surgery

| Premedication        | Route | Number (%) |
|----------------------|-------|------------|
| Midazolam            | IV    | 19 (21.3)  |
|                      | IM    | 3 (3.4)    |
| Ketamine             | IV    | 15 (16.9)  |
|                      | IM    | 3 (3.4)    |
| Glycopyrrolate       | IV    | 14 (15.7)  |
|                      | IM    | 4 (4.5)    |
| Atropine             | IV    | 9 (10.1)   |
|                      | IM    | 3 (3.4)    |
| Thiopental           | IV    | 8 (9.0)    |
| Propofol             | IV    | 3 (3.4)    |
| Diazepam             | IV    | 1 (1.1)    |
| Fentanyl             | IV    | 4 (4.5)    |
| Dexametomidine       | IV    | 2 (2.2)    |
| Meperidine           | IV    | 1 (1.1)    |
| All responses        |       | 89 (100)   |

Multiple responses are possible. Values are expressed as numbers (%) of all responses. IV: intravenous administration, IM: intramuscular administration.

### Table 6. Non-pharmacological Interventions Actually Used and Their Perception of Effectiveness

| Non-pharmacological Intervention | Actually used intervention (n = 40) | Effective intervention (n = 39) | Ineffective intervention (n = 33) |
|----------------------------------|------------------------------------|---------------------------------|----------------------------------|
| Parental presence                | 31 (26.7)                          | 29 (60.4)                       | 3 (3.8)                          |
| Watching animated video          | 25 (21.6)                          | 13 (27.1)                       | 1 (1.3)                          |
| Conversation                     | 25 (21.6)                          | 4 (8.3)                         | 6 (7.7)                          |
| Toys                             | 17 (14.7)                          | 0                               | 4 (5.1)                          |
| Humors                           | 8 (6.9)                            | 0                               | 8 (10.1)                         |
| Playing video games              | 4 (3.4)                            | 0                               | 1 (1.3)                          |
| Reading books                    | 1 (0.9)                            | 0                               | 14 (17.9)                        |
| Operating room tour              | 1 (0.9)                            | 0                               | 12 (15.4)                        |
| Preoperative preparation video   | 0                                  | 1 (2.1)                         | 7 (8.9)                          |
| Hypnosis                         | 0                                  | 0                               | 10 (12.8)                        |
| Clowns                           | 0                                  | 0                               | 10 (12.8)                        |
| None                             | 4 (3.4)                            | 1 (2.1)                         | 2 (2.6)                          |
| All responses                    | 116 (100)                          | 48 (100)                        | 78 (100)                         |

Multiple responses are possible. Values are expressed as numbers (%) of all responses.
non-pharmacological interventional means.

**DISCUSSION**

This small-scale survey offers insights of current practice and the general opinions of pediatric anesthesiologists regarding preoperative anxiolytic interventions in children undergoing surgery in Korea. We found that the strategies used to reduce child anxiety were determined by an informally standardized hospital protocol or individual experience rather than a written policy. In contrast, 72% of US hospitals have a formal policy for premedication [3]. Without current best evidence, preoperative anxiolytic intervention based on hospital protocol may become dated, to the detriment of patients. In our opinion, decision making should be guided by formal policy integrated with individual clinical expertise and best available scientific evidence to ensure children are provided with the most effective and safe anxiolytic intervention.

Although many non-pharmacological interventions have been reported to be as effective as sedative premedication [8], respondents who wanted effective anxiolysis preferred pharmacological intervention, while those who wanted safe anxiolysis preferred non-pharmacological intervention. Our finding implies that anxiolytic intervention preference of pediatric anesthesiologists was usually determined by customarily established protocol or habitual choice rather than scientific research. And it also explains why actually used interventions did not consistently match with preferred interventions. The two most important purposes of premedication are to reduce anxiety and sympathetic activity during induction of anesthesia. In Korea, the sedative premedication rate for pediatric anesthesia (54.7%), as determined by the present study, is similar to those reported in Turkey, Germany, and the United States [5,9,10], but is much higher than reported in the United Kingdom for day-case surgery (19%) [7]. Although numerous drugs have been used in clinical practice, midazolam is currently the mainstay of sedative premedication for pediatric anesthesia. Its long history of safety, effectiveness, and minimal delay to discharge from post-anesthesia care unit well explain its global use in clinical practice. Because oral or intranasal midazolam, commonly used as a premedication in Europe and the US [5,9], is not currently available in Korea, respondents mostly administered midazolam intravenously in the preoperative holding area.

The routine use of anticholinergic agents prior to anesthesia and surgery now shows a declining trend, because of its adverse effects, such as, an uncomfortable dryness of mouth, and the introduction of less irritating anesthetics [11,12]. In the present study, respondents premedicated anticholinergic agents (glycopyrrolate and less frequently atropine) based on clinical requirements rather than routine use and principally administered via an intravenous route immediately before anesthesia, which is similar to European and Australian practice [5,12,13].

Respiratory depression was the most commonly experienced side effect of premedication, and was the main reason for avoiding sedative premedication in children and for administering premedication in preoperative holding areas equipped with sufficient resources to monitor and manage side effects rather than in ward. We presume that fear for respiratory depression (the most serious side effect of premedication) caused the majority of respondents to forbid the premedication of children less than 1 year old.

Nearly half of the respondents preferred non-pharmacological intervention, which was also the most commonly used type of intervention in clinical practice. PPIA was the most frequently employed non-pharmacological intervention by respondents. Although the large Cochrane review conducted by Yip et al. [8] concluded that PPIA did not reduce preoperative anxiety or improve cooperation during induction of anesthesia, the majority of our respondents believed PPIA is the most effective non-pharmacological anxiolytic intervention. In our survey, 78.0% of respondents agree with PPIA and 19.5% allowed routine PPIA. On the other hand, 50.0% of American anesthesiologists forbade PPIA [9], and most anesthesiologists in the UK and Canada allowed PPIA [14-16]. Discrepancies between countries may be due to the use of different induction techniques, legal implications, and economic issues, such as, operating room efficiency.

This study has several limitations that bear consideration. First, the response rate was only 26%, and thus, we cannot claim our survey accurately reflects anxiolytic practices used by Korean anesthesiologists in pediatric patients. Accordingly, we suggest a larger-scale study be initiated to confirm and supplement our findings in all anesthesiologists currently worked in Korea. Second, we did not investigate the use of anxiolytic intervention by patient age or hospital stay after surgery, which could significantly affect decision making.

Summarizing, pediatric anesthesiologists in Korea use both pharmacological and non-pharmacological interventions based on informally standardized hospital protocols to reduce child anxiety prior to surgery. Those requiring the effective reduction of anxiety were found to prefer pharmacological intervention and to favor the use intravenous midazolam, whereas those
wanting safe reduction of anxiety preferred non-pharmacological intervention and most frequently used parental presence during induction the anesthesia.

ACKNOWLEDGEMENTS

The authors thank professor Hee-Soo Kim and Byung Gun Lim, president and director of academic affairs, respectively, of the Korean Society of Pediatric Anesthesiologists (KSPA) for reviewing our survey questionnaire, granting permission to survey KSPA members and forwarding the e-mail responses. We also appreciate for all KSPA members who completed the survey.

REFERENCES

1. Kotiniemi LH, Ryhanen PT, Moilanen IK. Behavioural changes in children following day-case surgery: a 4-week follow-up of 551 children. Anaesthesia 1997; 52: 970-6.
2. Kain ZN, Mayes LC, O'Connor TZ, Cicchetti DV. Preoperative anxiety in children. Predictors and outcomes. Arch Pediatr Adolesc Med 1996; 150: 1238-45.
3. Kain ZN, Mayes LC, Bell C, Weisman S, Hofstadder MB, Rimar S. Premedication in the United States: a status report. Anesth Analg 1997; 84: 427-32.
4. Mirakhur RK. Preanaesthetic medication: a survey of current usage. J R Soc Med 1991; 84: 481-3.
5. Haas U, Motsch J, Schreckenberger R, Bardenheuer HJ, Martin E. Premedication and preoperative fasting in pediatric anesthesia. Results of a survey. Anaesthetist 1998; 47: 838-43.
6. Nagahama H, Yagi K, Noda M, Hara K, Kikuchi S, Nagatsu M, et al. A survey of opioid use in preanesthetic medication. Masui 1998; 47: 1373-6.
7. Payne K, Moore EW, Elliott RA, Moore JK, McHugh GA. Anaesthesia for day case surgery: a survey of paediatric clinical practice in the UK. Eur J Anaesthesiol 2003; 20: 325-30.
8. Yip P, Middleton P, Cyna AM, Carlyle AV. Non-pharmacological interventions for assisting the induction of anaesthesia in children. Cochrane Database Syst Rev 2009; (3): CD006447.
9. Kain ZN, Caldwell-Andrews AA, Krivutza DM, Weinberg ME, Wang SM, Gaal D. Trends in the practice of parental presence during induction of anesthesia and the use of preoperative sedative premedication in the United States, 1995-2002: results of a follow-up national survey. Anesth Analg 2004; 98: 1252-9.
10. Eisener Z, Ustun E. Epidemiology in pediatric anesthesia. A computerized survey of 10,000 anesthetics. Turk J Pediatr 1994; 36: 11-9.
11. Rautakorpi P, Ali-Melkkila T, Kanto J. Anticholinergic drugs in pediatric anaesthesia. A survey of their present position in Finland 1990. Ann Chir Gynaecol 1994; 83: 64-8.
12. Rautakorpi P, Manner T, Kanto J. A survey of current usage of anticholinergic drugs in paediatric anaesthesia in Finland. Acta Anaesthesiol Scand 1999; 43: 1057-9.
13. Parnis SJ, van der Walt JH. A national survey of atropine use by Australian anaesthetists. Anaesth Intensive Care 1994; 22: 61-5.
14. Wright KD, Finley GA, Lee DJ, Rauzi M, Sharpe D. Practices of anesthesiologists to alleviate anxiety in children and adolescents in Canada. Can J Anaesth 2013; 60: 1161-2.
15. Roman DE, Barker I, Reilly CS. Anaesthetists’ attitudes to parental presence at induction of general anaesthesia in children. Anaesthesia 1993; 48: 338-40.
16. Kain ZN, Ferris CA, Mayes LC, Rimar S. Parental presence during induction of anaesthesia: practice differences between the United States and Great Britain. Paediatr Anaesth 1996; 6: 187-93.