Pediatric Anxiety, Premedication and Awareness: Where Are We Now?

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Pediatric patients who are hospitalized or subject to surgery suffer anxiety from a number of sources. Stranger anxiety and fear of separation from parents are common in infants and toddlers. Preschool children fear separation from family; they have vivid , sometimes frightening, imaginations about what happens during surgery. Preschoolers fear the OR itself and they fear that they will not awaken after surgery. School-age children separate from parents more easily and understand and accept reassurance. While they develop a curiosity about the operating room, monitors, masks, etc. they continue to have a fear of surgery itself and potential pain afterward. Adolescents fear disease and treatment, mutilation, loss of control and inability to cope with their plight. They fear death and awakening during surgery.

Repeated hospitalization sensitizes some children to the situation while others become less fearful with subsequent visits. A number of predictors of preoperative pediatric anxiety have been identified: previous exposure to the hospital, age and parental anxiety level. (1) Other factors influencing postoperative behavior changes include cultural influence and socioeconomic status. Preadmission tours, videos and preoperative clinic visits decrease preoperative anxiety of parents as well as children. Any child old enough to understand conversation should be prepared for surgery with a basic, age-appropriate, truthful explanation of what is to happen before and at induction; a brief description of the OR, monitors, and mask can be nonthreatening. Additionally, a description of the immediate postoperative period will prevent fear and panic in the PACU. Parents may feel children are too young or will be unnecessarily upset by discussion of surgery.

Anesthesiologists occasionally find it difficult to identify children with significant anxiety. The most misunderstood child is the shy, inhibited one who appears unconcerned; he/she asks few questions due to shyness and is perceived to be well-informed by their lack of questions. Even if children do not initiate questions, it is helpful to tell them that they will sleep throughout their surgery and will awaken at the end.

Premedication is commonly used to reduce preoperative anxiety, to facilitate separation from parents and to promote acceptance of mask induction. Premedication leading to a calm patient also minimizes parental anxiety. Kain et al demonstrated that patients receiving premedication exhibit fewer postoperative negative behavioral changes including regressive behavior, aggression, sleep and eating disturbances, and regression of toilet training. (2) Others report an increase in negative behaviors in children receiving midazolam (3)

Infants less than 6 months of age require no anxiolysis; premedication may be used to blunt effects of anesthetic induction, however (anticholinergic). Older anxious children with no contraindication to premedication (airway concerns or CNS disease) benefit from

premedication. Children 6 months of age to 4 years of age have previously been reported to experience the greatest negative postoperative behavior changes (4) and benefit from premedication.

Midazolam currently is the most commonly prescribed premedicant for pediatric and adult patients. Kain found wide geographic variations in sedative practice; HMO enrollment was an independent negative predictor of preanesthetic premedicant use. (5)

Routes for midazolam administration include PO, IM, IV, sublingual, intranasal and rectal; bioavailability varies with route of administration (IV 100%, IM 90%, rectal/nasal 20-50%, PO 15-30%). Onset with PO dosing is 10-15 minutes with peak effect at 30 minutes; there is no apparent effect on volume or pH of gastric contents. (6) At dosages of 0.5-1mg/kg PO (maximum dose of 20mg), children (7) and adolescents (8) were effectively sedate without bradycardia, hypotension, O2 desaturation, or airway obstruction. Brosius and colleagues report 1 in 25 patients unarousable to verbal and mild tactile stimulation following premedication with this dosage (8). Recent studies show effective sedation with no prolongation of recovery. (9, 10) An equal number of studies may be cited which report delayed emergence when midazolam is used as premedicant and the anesthetic includes synergistic agents such as thiopental and opioids. One study found increased nausea, vomiting and hallucinations in pediatric patients premedicated with oral lorazepam whereas older adolescent patients did not suffer the same effects. (11)

Several other classes of drugs have been used and continue to be used successfully for preanesthesia anxiolysis and sedation, including dissociative agents, barbiturates, opioids and alpha-2 receptor agonists.

Some centers use parental presence on induction as a substitute for premedication. This is well tolerated if parents are calm and if OR staffing allows for a dedicated escort to accompany the parents out of the OR when the child loses consciousness. Parents who are present for an induction for the first time should be warned about behaviors during the excitement state, airway noise, and eyes rolling upward. Kain and colleagues (12) found that oral premedication decreased patient anxiety on induction significantly more than did parental presence and found no difference in the level of anxiety in patients receiving midazolam only and those patients who received midazolam and had parents present at induction. Moreover, parents in the premedication group had less anxiety than did parents in the parental presence group. Some parents wish to be present and feel that they contribute to their child's comfort; surveys show that a majority of parents (55%vs45%) would return for induction on subsequent surgeries if given a choice to be present or not (13)

Intraoperative Awareness and Recall

There are no published data on intraoperative awareness in pediatric patients. Recent clinical studies which employ commercially available monitors for depth of sedation during anesthesia in pediatric patients have focused on utility of the monitors in pediatric patients rather than the incidence of awareness. Anecdotal cases of awareness in children during anesthesia are known, however, prospective observational studies detecting awareness in children have yet to be published. A prospective study by Ranta et al (14) evaluated the incidence of awareness under anesthesia in patients 12 years of age and

older in a total patient population of 4800 undergoing general surgery in a secondary hospital; the incidence of awareness was 0.4%, the youngest patient having undisputed awareness was 20 years of age. In a study of explicit recall during intraoperative wake-up tests during scoliosis surgery in 34 adolescent and preadolescent patients, McCann et al (15) found recall of the wake-up test itself in one patient and explicit recall (patients told to remember the color teal) in 5 patients (17.6% overall).

In adult studies the incidence of awareness under anesthesia is reported in the range of 0.2-1.5%; the incidence is two-fold higher in cases in which muscle relaxants are used. International studies (16, 17, 18) report 0.1-0.2% awareness with higher risk in cardiac, obstetric and trauma cases. US data were recently published by Sebel et al (19) from a multi-center, prospective observational cohort study conducted in 7 academic hospitals. A total of 19,576 patients were enrolled in the AIM (Awareness Incidence and Monitoring) Trial; each institution reported a consistent incidence of awareness of 0.13%, or 1-2 cases per 1000. The incidence in cardiac patients undergoing bypass was 0.95%. The incidence was not different between males and females. There were additional cases (0.23%) of possible awareness, in which confirmation could not be made. Dreaming was reported in 6.04% of patients.

Awareness has been reported as a leading cause of patient dissatisfaction with anesthesia (20) and may lead to significant psychological sequelae and post-traumatic stress disorder (PTSD) characterized by severe anxiety, panic disorder, sleep disturbance, nightmares, flashbacks, avoidance of hospitals and medical personnel, and preoccupation with death. (21, 22, 23) Nine of 16 patients with a history of intraoperative awareness interviewed by Osterman (22) met diagnostic criteria for PTSD a mean of 17.9 years following the intraoperative event. Osterman's patients were required to exhibit 3 types of symptoms in order to meet criteria for PTSD. Re-experiencing (the recall of fragments of surgery in nightmares or flashbacks associated with paralysis, suffocation or pain), avoidance of hospitals, physicians, TV programs with medical themes, and hyperarousal (easy startle, hypervigilance, irritability) were required. Jury awards for awareness under anesthesia are a median of $18,000 (21). Gan surveyed patients of average income ($45-60K), 91% highschool graduates, 90% of whom had experienced surgery previously to determine what patients would be willing to pay to avoid intraoperative awareness (24). Patients were willing to pay an average of $34 ($0-42) for a monitor that would assist in avoiding awareness (compared to $33 to avoid postoperative nausea and vomiting and $50 to avoid postoperative pain.) This figure increased to $43 if insurance was paying for the monitor; the figure decreased to $33 if the incidence of awareness was quoted as 1/10 the original estimate. Of the 20 million general anesthetics administered in the US yearly, there are approximately 20,000 potential cases of intraoperative awareness given the current estimates. Prospective observational studies in appropriate pediatric patients are needed to determine the incidence of awareness in this population.

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