

Postoperative Nausea and Vomiting in Children

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A three-year-old, otherwise healthy, female presents for strabismus surgery. Her mother has a history of postoperative nausea and vomiting (PONV) and is concerned about the possibility of PONV for her child. The medical student requests to review the risk factors for PONV in children.

What Is Postoperative Nausea and Vomiting (PONV) and Postdischarge Nausea and Vomiting (PDNV)?

PONV is nausea/vomiting within 24 hours after surgery. Nausea/vomiting within the 24–72 hour time period is called PDNV.

What Is the Incidence of PONV in Children?

Multiple studies show the incidence is about 10% in outpatient ambulatory pediatric surgery. Older studies where antiemetics were not given routinely demonstrate an incidence of PONV up to 80%. There is no published incidence in pediatric inpatients.

What Are the Risk Factors for PONV in Children?

Primary risk factors for PONV in children are:

- Preoperative nausea and vomiting
- Age >3 years, and especially ages 6–13
- Surgery >30–45 minutes
- History of PONV with previous anesthesia
- Motion sickness
- ENT (tympanoplasty and adenotonsillectomy)/strabismus surgery
- Multiple doses of opioids

Why Is There a Minimal Incidence of PONV in Children under Three Years of Age?

The primary mediator of nausea/vomiting is the chemoreceptor trigger zone (CTZ) as well as the vomiting center in the medulla oblongata in the brain. The thought process is that those areas are not well developed until the age of three in humans, and therefore there is decreased susceptibility in this age group.

Is There a Multimodal PONV Model in Children? Is There a Tiered Model for PONV Based on Risk Factors?

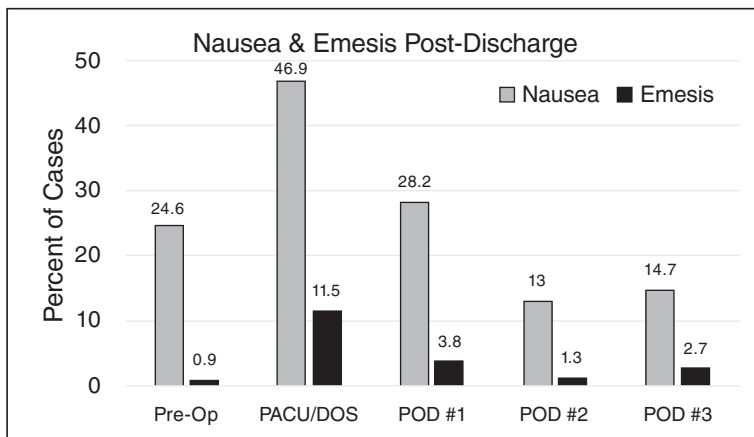
The multimodal PONV model has not been rigorously studied in the pediatric population. Similarly, the tiered model such as the Apfel model does not have a pediatric equivalent. Given that the risk factors for adults may not translate to children, it is hard to make a recommendation at this time.

What Anesthetic Factors Can Contribute to PONV?

The incidence of PONV can be decreased by use of propofol instead of inhaled agents and minimizing use of opioids by using nonsteroidal anti-inflammatory drugs (NSAIDs) and regional analgesia. Other anesthetic considerations include limiting postoperative oral intake, increasing IV hydration, and prophylactic administration of antiemetic medications, such as ondansetron. Combination (multimodal) therapy with different classes of antiemetics (e.g., dexamethasone) more successfully prevents PONV than one type of antiemetic alone. Intraoperative evacuation of gastric contents does not reduce PONV in adults but has not been studied in pediatric patients.

Table 5.1 Incidence of postoperative and post discharge nausea and vomiting in relation to medical management by number of antiemetics administered

Antiemetics	# of patients with nausea on POD 0 (N, %)	# of patients with nausea on POD 1 (N, %)	# of patients with emesis on POD 0 (N, %)
Fluids only	9/18 (50%)	4/17 (23.5%)	4/21 (19.0%)
Ondansetron only	18/30 (60%)	6/21 (28.6%)	3/33 (9.1%)
Ondansetron & Dexamethasone	25/63 (39.7%)	11/39 (38.2%)	5/67 (7.5%)

**Figure 5.1** Incidence of postdischarge nausea and vomiting in children after ambulatory surgery.

Once PONV Occurs, How Is It Treated?

PONV that occurs despite intraoperative administration of prophylactic antiemetics is very difficult to treat successfully. Options include increased hydration (e.g., 30 cc/kg of intravenous crystalloids), or antihistamines such as diphenhydramine or metoclopramide. Promethazine may also be efficacious but must be given intramuscularly because of the risk of tissue damage when given into a subcutaneous IV infiltration.

What Predicts PDNV? What Is Its Incidence?

Chandrakantan and colleagues performed a study looking at pediatric PDNV. They studied ambulatory

pediatric surgical patients ASA I–II for all ambulatory surgical types. Ondansetron was given to 93/113 (83.3%) of our patients, and dexamethasone was given to 65/113 (57.5%) intraoperatively. Sixty-three (55.7%) patients received both antiemetics. Children receiving only intraoperative fluids as antiemetic prophylaxis were classified as receiving zero antiemetics. There was a 10% incidence of PONV on day one, with rapid decrement thereafter (Figure 5.1 and Table 5.1).

What Are the Risk Factors for PDNV?

Presence of PONV and post anesthesia care unit pain seem to predict PDNV, although further study is needed. Number of antiemetics used intraoperatively does not seem to correlate positively or negatively with PDNV.

Suggested Reading

- Apfel CC, Kranke P, Eberhart LHJ, et al. Comparison of predictive models for postoperative nausea and vomiting. *Br J Anaesth*. 2002 Feb;88(2):234–40. PMID: 11883387.
- Bourdaud N, Devys JM, Bientz J, et al. Development and validation of a

- risk score to predict the probability of postoperative vomiting in pediatric patients: the VPOP score. *Paediatr Anaesth*. 2014 Sep;24(9):945–52. PMID: 24823626.
- Chandrakantan A, Glass PS. Multimodal therapies for postoperative nausea and vomiting,

- and pain. *Br J Anaesth*. 2011 Dec;107 Suppl 1:i27–40. PMID: 22156268.
- Eberhart LHJ, Geldner G, Kranke P, et al. The development and validation of a risk score to predict the probability of postoperative vomiting in pediatric patients. *Anesth Analg*. 2004; 99(6):1630–7. PMID: 15562045.