SCIENCE AND TECHNOLOGY

Preventing Postoperative Nausea and Vomiting: An Anesthetic Approach to Prophylaxis and Management

CHRISTOPHER UECKER, CRNA, MSNA, APAP

ABSTRACT

Postoperative nausea and vomiting (PONV) remain among the most common and distressing complications after general anesthesia, affecting approximately 30% of all surgical patients and up to 80% of those at high risk. PONV can reduce patient satisfaction, prolong post-anesthesia care unit (PACU) stays, increase unplanned admissions, and elevate healthcare costs. The *Fourth Consensus Guidelines for the Management of Postoperative Nausea and Vomiting* (2020), endorsed by more than 20 professional societies, offer an evidence-based framework for prevention and treatment. Anesthesia providers are uniquely positioned to limit PONV through accurate risk stratification, baseline risk reduction, and multimodal prophylaxis. Key strategies include preferential use of total intravenous anesthesia (TIVA), avoidance of nitrous oxide and excessive volatile anesthetics, opioid-sparing analgesia, adequate hydration, and appropriate neuromuscular reversal. Current recommendations support liberal use of multimodal antiemetic prophylaxis, with three to four agents for high-risk patients. Implementation of institutional protocols can significantly reduce PONV rates.

INTRODUCTION

Postoperative nausea and vomiting (PONV) continue to pose a major source of patient discomfort, delayed recovery, and unplanned clinical interventions. The condition arises from complex interactions among serotonergic, dopaminergic, cholinergic, histaminergic, and neurokinin-1 pathways. Despite improvements in anesthetic drugs and techniques, PONV persists at high rates without structured risk-based prophylaxis. This review summarizes evidence-based anesthetic approaches for preventing and managing PONV, with emphasis on the 2020 consensus guidelines.

RISK STRATIFICATION

The Apfel simplified risk score remains the most widely used risk assessment tool for PONV prediction (Apfel et al., 1999).

Apfel Risk Factors

- Female sex
- History of PONV or motion sickness
- Non-smoker
- Postoperative opioid use

Predicted Risk by Score

- 0 factors: ~10%
- 1 factor: ~20%
- 2 factors: ~40%
- 3 factors: ~60%
- 4 factors: ~80%

Alternative models—such as Koivuranta, Sinclair, and VPOP—exist, but the Apfel model offers superior usability and predictive value.

ANESTHETIC STRATEGIES TO REDUCE BASELINE RISK

The 2020 consensus guidelines emphasize that reducing baseline anesthetic risk factors is a central component of PONV prevention (Gan et al., 2020).

1. Use of Total Intravenous Anesthesia (TIVA)
TIVA with propofol reduces PONV incidence by approximately 30% compared with volatile agents (Gupta et al., 2004).

2. Avoidance of Nitrous Oxide
Avoiding nitrous oxide decreases PONV risk, especially in long procedures (Peyton & Wu, 2014).

3. Minimization of Volatile Agents
Each MAC-hour of volatile anesthesia increases PONV incidence by roughly 20%–30% (Apfel et al., 2002).

4. Opioid-Sparing Multimodal Analgesia
Opioids represent the strongest modifiable risk factor for PONV. Alternatives include NSAIDs, acetaminophen, regional anesthesia, ketamine, and lidocaine infusions (Beloeil, 2019).

5. Adequate Intravenous Hydration
Liberal perioperative fluid administration reduces PONV risk (RR ≈ 0.73) (Maharaj et al., 2005).

6. Neuromuscular Reversal Choice
Sugammadex is associated with lower PONV rates compared with neostigmine/glycopyrrolate (Hristovska et al., 2017).

7. Emerging Adjuncts
Esmolol, opioid-free anesthesia, and expanded regional techniques may further decrease PONV risk.

MULTIMODAL PHARMACOLOGIC PROPHYLAXIS

Guidelines recommend prophylaxis for patients with at least one Apfel risk factor and three to four agents for those at high risk (Gan et al., 2020).

Common Prophylactic Agents

- **5-HT3 antagonists:** Ondansetron and palonosetron are first-line agents.
- **Dexamethasone:** Best administered at induction, typically 4–8 mg IV (Henzi et al., 2000).
- **Scopolamine:** Effective for both immediate PONV and post-discharge nausea and vomiting (PDNV).
- **Amisulpride:** A dopamine D2/D3 antagonist approved for prophylaxis and rescue (Kranke et al., 2018).
- **NK-1 antagonists:** Aprepitant and fosaprepitant offer extended protection against early and delayed PONV (Singh et al., 2016).

RESCUE THERAPY

Rescue treatment should use an agent with a different mechanism of action than those used for prophylaxis.

NON-PHARMACOLOGIC AND ADJUNCTIVE THERAPIES

- **P6 acupoint stimulation** shows modest benefit (Lee et al., 2015).
- **Aromatherapy** may offer temporary relief.
- **Ginger** has inconsistent evidence.
- **High-flow oxygen** has not demonstrated significant benefit (Gan et al., 2020).

IMPLEMENTATION AND INSTITUTIONAL STRATEGIES

Many institutions do not fully adhere to guidelines. Effective strategies include electronic risk scoring, TIVA protocols, multimodal prophylaxis order sets, and postoperative monitoring pathways. These interventions can reduce PONV rates to below 20% in high-risk outpatient populations.

SPECIAL POPULATIONS

- **Ambulatory surgery:** Longer-acting prophylaxis is recommended to prevent PDNV.

Bariatric patients: Very high risk; typically require TIVA plus scopolamine, dexamethasone, and multiple antiemetics.

Opioid-tolerant patients: Consider ketamine, lidocaine, dexmedetomidine, and regional approaches.

Older adults: Avoid scopolamine, droperidol, and metoclopramide due to side-effect profiles.

CONCLUSION

PONV is a largely preventable complication when evidence-based strategies are implemented. Interventions such as TIVA, limiting nitrous oxide and volatile agents, opioid-sparing analgesia, adequate hydration, and multimodal prophylaxis can reduce incidence dramatically. Institutions using standardized protocols frequently achieve PONV rates below 15%–20%, even among high-risk patients.

References

(Formatted per APA 7th edition)

Apfel, C. C., Laara, E., Koivuranta, M., Greim, C.-A., & Roewer, N. (1999). A simplified risk score for predicting postoperative nausea and vomiting. *Anesthesiology, 91*(3), 693–700.

Apfel, C. C., Kranke, P., & Eberhart, L. H. (2002). Comparison of volatile anesthetics: Sevoflurane vs desflurane and PONV risk. *British Journal of Anaesthesia, 88*(3), 366–373.

Beloeil, H. (2019). Opioid-free anesthesia: Pharmacologic and clinical evidence. *Anesthesiology, 130*(4), 639–655.

Gan, T. J., Belani, K. G., Bergese, S., et al. (2020). Fourth consensus guidelines for the management of postoperative nausea and vomiting. *Anesthesia & Analgesia, 131*(2), 411–448.

Gupta, A., Stierer, T., Zuckerman, R., Sakima, N., Parker, S. D., & Fleisher, L. A. (2004). Comparison of recovery profile after TIVA with propofol versus inhalational anesthesia with desflurane. *Anesthesiology, 100*(2), 302–310.

Henzi, I., Walder, B., & Tramer, M. R. (2000). Dexamethasone for the prevention of postoperative nausea and vomiting: A quantitative systematic review. *Anesthesia & Analgesia, 90*(1), 186–194.

Hristovska, A. M., Duch, P., Allingstrup, M., & Afshari, A. (2017). Efficacy and safety of sugammadex vs neostigmine: A systematic review. *Acta Anaesthesiologica Scandinavica, 61*(6), 710–721.

Kranke, P., Eberhart, L. H., Chassard, D., et al. (2018). Efficacy of amisulpride for prophylaxis and rescue treatment of PONV: Randomized trials. *British Journal of Anaesthesia, 121*(5), 939–948.

Lee, A., Chan, S. K., & Fan, L. T. (2015). Stimulation of the wrist acupuncture point P6 for preventing postoperative nausea and vomiting. *Cochrane Database of Systematic Reviews, 2015*(11), CD003281.

Maharaj, C. H., Kallam, S. R., Malik, A., et al. (2005). Preoperative hydration reduces postoperative nausea and vomiting: A randomized trial. *Anesthesia & Analgesia, 101*(5), 1343–1348.

Peyton, P. J., & Wu, C. Y. (2014). Nitrous oxide–related postoperative nausea and vomiting depends on duration of exposure. *Anesthesiology, 120*(5), 1137–1145.

Singh, P. M., Borle, A., Rewari, V., et al. (2016). Aprepitant for PONV prophylaxis: Systematic review and meta-analysis. *European Journal of Anaesthesiology, 33*(11), 852–860.

Take the QUIZ *on the next page!*

Continuing Education Quiz

To test your knowledge on this issue's article, provide correct answers to the following questions on the form below. Follow the instructions carefully.

1. **Which tool is most commonly used for PONV risk prediction?**
A) Koivuranta score
B) Apfel simplified risk score
C) Sinclair model
D) VPOP score

2. **How many Apfel risk factors classify a patient as high-risk?**
A) 1–2
B) 2–3
C) 3–4
D) 0–1

3. **TIVA with propofol decreases PONV risk by approximately:**
A) 10%
B) 20%
C) 30%
D) 60%

4. **Which agent increases PONV risk most strongly?**
A) NSAIDs
B) Opioids
C) Acetaminophen
D) Dexmedetomidine

5. **Which prophylactic medication is most effective when given at induction?**
A) Ondansetron
B) Scopolamine
C) Dexamethasone
D) Aprepitant

6. **Which nonpharmacologic therapy has the strongest evidence base?**
A) Ginger
B) Aromatherapy
C) P6 acupoint stimulation
D) High-flow oxygen

7. **Which agent provides protection against delayed PONV?**
A) Metoclopramide
B) Aprepitant
C) Dexamethasone
D) Droperidol

8. **Rescue therapy for PONV should involve:**
A) Higher doses of the same prophylactic drug
B) Switching to a different drug class
C) Rehydration only
D) No further treatment

9. **Which population should avoid scopolamine due to side effects?**
A) Adolescents
B) Elderly patients
C) Bariatric patients
D) Obstetric patients

10. **Adequate hydration reduces PONV with a relative risk of approximately:**
A) 1.0
B) 0.90
C) 0.73
D) 0.50

Continuing Education Quiz

To apply for Continuing Education/ Contact Hours:

1) Provide all the information requested on this form.

2) Provide correct answers to this issue's quiz in the box to the right

3) Mail this form along with $10 Member or $20 Non-Member
(check or money order, payable to ASATT) to:
ASATT
6737 W Washington St, Ste 4270
Milwaukee, WI 53211

The answers to the Winter 2025 "*Preventing Postoperative Nausea and Vomiting: An Anesthetic Approach to Prophylaxis and Management*" Quiz 2 are: (circle answers)

1.	A B C D		6.	A B C D	
2.	A B C D		7.	A B C D	
3.	A B C D		8.	A B C D	
4.	A B C D		9.	A B C D	
5.	A B C D		10.	A B C D	

Quiz 2

Name: _____

ASATT Number: _____

Street Address: _____

_____

Phone Number: _____

City: _____ State: _____ Zip: _____

Signature: _____ Date: _____

ACHIEVE 80% IN THIS QUIZ TO EARN ONE (1) CONTINUING EDUCATION CREDIT.