PONV and The Role of Therapeutic Decision Support

Joseph V. Pergolizzi, Jr., M.D.

Adjunct Assistant Professor
Johns Hopkins University

Editor-in-Chief
Clinical Researcher

Naples Anesthesia and Pain Associates
Naples, Florida
Content

- Contributing Factors
- Risk Assessment and Stratification
- Review Antiemetic Armamentarium
- Examine the Role of Multi-modal Therapy
- Cost Effectiveness of Antiemetics
- Review of Hot Topics
Incidence of PONV

- Overall range - 20% to 30%\(^1\)
- Outpatient range - 20% to 80%, depending on the patient population\(^2\)
- Study Variability

Contributors to PONV

- Patient characteristics (No control over)
- Surgical factors
- Choice of anesthetic agent
- Anesthesia techniques (Some control over)
- Postoperative factors

Adapted from Philip BK. Etiologies of postoperative nausea and vomiting. *P & T* 1997;22 (suppl7S): 18S-25S.
Patient Factors Affecting Incidence of PONV

- History of PONV or motion sickness
- Age (younger)
- Gender (female)
- Obesity
- Anxiety
- Concomitant Disease i.e., Gastroparesis
- Non-smokers

Surgical Factors

- Duration of surgery
  - > 1 Hour

- Surgical site and procedure
  - ENT: Middle Ear Vestibular Afferents 38-48%
  - Adenotonsillectomy 36-76%
  - Ophthalmic Strabismus 10%
    Early, 60% Delayed
  - Gynecologic D&C > C
  - Laparoscopy 40 - 77%
  - Breast Surgery
  - Shoulder Surgery
  - Abdominal Wall 15% vs. Intra-abdominal 70%
  - Plastic and Reconstructive
  - Dental

Anesthetic Factors Affecting Incidence of PONV

- Premedications
- Anesthetic agents
- Duration and depth of anesthesia
- Anesthesia technique

Choice of Anesthetic Agents

- Opioids
  - μ opioid receptors – area postrema
  - Delay gastric emptying, sensitize CNVIII, stimulate release of vasopressin and serotonin
- Hypnotics (Etomidate > Ketamine > Thiopental > Propofol)
- Nitrous Oxide (Lonie vs. Hovorka)
- Potent Inhaled Agents (Isoflurane > Enflurane > Sevo > Des)
- Neuromuscular Blockade Reversal
  - Acetylcholinesterase inhibitors (neostigmine) GI and Central
  - Anticholinergic agents: Glycopyrrolate (p) > Atropine (p & c)

Postoperative Factors Affecting Incidence of PONV

- Pain
  - Pelvic, visceral
- Dizziness
- Early ambulation (vestibular)
- Post Pain Management
  - Opioid administration
- Premature oral intake
  - PACU discharge criteria

Medical Consequences of PONV

- Patient discomfort (mild to severe)
- Wound dehiscence
- Aspiration of vomit
- Electrolyte imbalance and dehydration
- Interruption in or delay of oral drug therapy, fluid intake, or eating

Simplified Risk Scoring

- **Four predictors**
  - Female gender
  - History of motion sickness/PONV
  - Non-smoking
  - Use of postoperative opioids

- **Incidence of PONV**
  
<table>
<thead>
<tr>
<th>Score</th>
<th>Incidence</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>10%</td>
</tr>
<tr>
<td>1</td>
<td>21%</td>
</tr>
<tr>
<td>2</td>
<td>39%</td>
</tr>
<tr>
<td>3</td>
<td>61%</td>
</tr>
<tr>
<td>4</td>
<td>79%</td>
</tr>
</tbody>
</table>

Prophylactic Antiemetic Intervention Assessment Scale (T.J. Gan)

3 Points Each
- History of PONV
- History of motion sickness
- Gynecological laparoscopy
- Breast reconstruction

2 Points Each
- Facelift surgery
- Strabismus or middle ear surgery
- Neurosurgery
- Obesity

3 or More Points
Prophylactic Antiemetic is Indicated

1 Point Each
- Preadolescent
- Female
- Anxiety
- Laparoscopic cholecystectomy
- Intraoperative or postoperative opioid
- Duration of anesthesia > 60 min
Proposed Sites of Action: Antiemetic Drug Classes

- **Cortical**
  - Cannabinoids
  - Benzodiazepines

- **Visceral Afferents**
  - Metoclopramide (high dose)
  - Serotonin Antagonists

- **Chemoreceptor Trigger Zone**
  - Phenothiazines
  - Butyrophenones
  - Metoclopramide
  - Serotonin Antagonists

- **Vomiting Center**
  - Antihistamines
  - Anticholinergics

# Receptor Site Affinity of Antiemetic Agents

<table>
<thead>
<tr>
<th>Pharmacologic group/drug</th>
<th>Dopamine (D₂)</th>
<th>Muscarinic Cholinergic</th>
<th>Histaminic</th>
<th>Serotonin (5-HT₃)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phenothiazines</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Fluphenazine</td>
<td>++++</td>
<td>+</td>
<td>++</td>
<td>-</td>
</tr>
<tr>
<td>Chlorpromazine</td>
<td>++++</td>
<td>++</td>
<td>++++</td>
<td>+</td>
</tr>
<tr>
<td>Prochlorperazine</td>
<td>++++</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Butyrophenones</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Droperidol</td>
<td>++++</td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Haloperidol</td>
<td>++++</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Domperidone</td>
<td>++++</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antihistamines</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diphenhydramine</td>
<td>+</td>
<td>++</td>
<td>++++</td>
<td>-</td>
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<tr>
<td>Promethazine</td>
<td>++</td>
<td>++</td>
<td>++++</td>
<td>-</td>
</tr>
<tr>
<td>Anticholinergic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scopolamine</td>
<td>+</td>
<td>++++</td>
<td>+</td>
<td>-</td>
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<tr>
<td>Benzamides</td>
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<tr>
<td>Metoclopramide</td>
<td>+++</td>
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<td>+</td>
<td>++</td>
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<tr>
<td>5-HT₃ Receptor Antagonists</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Ondanensetron</td>
<td>-</td>
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<td>-</td>
<td>++++</td>
</tr>
<tr>
<td>Granisetron</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>++++</td>
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<tr>
<td>Tricyclic Antidepressants</td>
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<tr>
<td>Amitriptyline</td>
<td>+++</td>
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<td>++++</td>
<td>-</td>
</tr>
<tr>
<td>Nortriptyline</td>
<td>+++</td>
<td>++</td>
<td>+++</td>
<td>-</td>
</tr>
</tbody>
</table>

Number of positive signs (+) indicates degree of activity; negative sign (-) indicates no activity.

## Agents Overview

<table>
<thead>
<tr>
<th>Drug</th>
<th>Class</th>
<th>Route</th>
<th>Onset</th>
<th>Doses in 24h</th>
<th>Duration</th>
<th>Side Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ondansetron</td>
<td>5-HT₃-receptor antagonist</td>
<td>IV</td>
<td>10 min</td>
<td>1</td>
<td>24 h</td>
<td>HA, light-headedness, abdominal pain, constipation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IM</td>
<td>41 min</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>PO/ODT</td>
<td>15 min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dolasetron</td>
<td>5-HT₃-receptor antagonist</td>
<td>IV</td>
<td>30-35 min</td>
<td>1</td>
<td>24 h</td>
<td>HA, hypotension, dizziness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PO</td>
<td>1 h</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Promethazine</td>
<td>Phenothiazine</td>
<td>IV/IM/PO/PR</td>
<td>5 min</td>
<td>4-6</td>
<td>4-6 h</td>
<td>Dry mouth, blurred vision</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>20 min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prochlorperazine</td>
<td>Phenothiazine</td>
<td>IV/IM/PO/PR</td>
<td>-</td>
<td>2-4</td>
<td>-</td>
<td>EPS, drowsiness, dizziness</td>
</tr>
<tr>
<td>Reglan</td>
<td>Substituted benzamide</td>
<td>IV/IM/PO</td>
<td>1-3 min</td>
<td>4</td>
<td>1-2 h</td>
<td>EPS, drowsiness, lassitude</td>
</tr>
<tr>
<td>TD Scop</td>
<td>Anticholinergic</td>
<td>Patch</td>
<td>3-4 h</td>
<td>1/3</td>
<td>24 h</td>
<td>Dry mouth, drowsiness</td>
</tr>
</tbody>
</table>
Development of Transdermal Scopolamine

- 1979: Received FDA approval for prevention of nausea and vomiting associated with motion sickness
- 1994: Product voluntarily withdrawn by company
- Crystal formation, which posed a risk of subpotency
  - NOT an issue with efficacy/safety
- 1997: Transderm Scop was reintroduced with a new manufacturing process
Indications

- Prevention of nausea and vomiting associated with:
  - Motion sickness
  - Recovery from anesthesia and surgery
Transdermal Scopolamine for PONV

Schematic representation of the transdermal delivery skin patch

- Drug reservoir (≈1.31 mg scopolamine)
- Adhesive layer provides priming dose (≈0.23 mg scopolamine)
- Rate-limiting membrane
- Impermeable backing
- Skin surface

Transdermal scopolamine prescribing information.
Pharmacokinetics of Transdermal Scopolamine

- Detected in plasma within 4 hr, peak within 24 hr
- Crosses placenta and blood-brain barrier
- Extensively metabolized
- Half-life 9.5 hr after patch removal
  - Potential drug interactions
  - Decreased absorption of oral drugs
  - Additive CNS effects with sedatives, tranquilizers, alcohol
  - Additive anticholinergic effects with antihistamines, TCAs, muscle relaxants

Prescribing information. Transderm Scop.
Pharmacokinetics of Transdermal Scopolamine

<table>
<thead>
<tr>
<th>Absorption</th>
<th>Reaches therapeutic levels at 4 hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution</td>
<td>Crosses placenta and blood-brain barrier</td>
</tr>
<tr>
<td>Metabolism</td>
<td>Extensively metabolized</td>
</tr>
<tr>
<td>Excretion</td>
<td>Half-life 9.5 h after patch removal</td>
</tr>
<tr>
<td>Drug interactions</td>
<td>Potential drug interactions</td>
</tr>
<tr>
<td></td>
<td>- Additive CNS effects with sedatives, tranquilizers, alcohol</td>
</tr>
<tr>
<td></td>
<td>- Additive anticholinergic effects with antihistamines, TCAs, muscle relaxants</td>
</tr>
<tr>
<td></td>
<td>- Decreased absorption of oral drugs</td>
</tr>
</tbody>
</table>

Transdermal scopolamine prescribing information.
Prophylaxis Protocol Using Transderm Scop®

- One Transderm Scop patch prevents PONV for up to 24 hours post surgery

PONV Prevention With Transderm Scop

- Apply patch at presurgical consult
- Surgery begins (3-hour surgery)
- Transderm Scop reaches therapeutic plasma levels
- Continues to prevent PONV

Hours: 0 2 4 8 16 20 24 28
### Transdermal Scopolamine in PONV

<table>
<thead>
<tr>
<th>Type of Surgery</th>
<th>Control</th>
<th>N</th>
<th>Outcome</th>
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<tbody>
<tr>
<td>Cesarean section</td>
<td>Placebo</td>
<td>203</td>
<td>↓ PONV during hours 2 to 10 and antiemetic drug requirements</td>
</tr>
<tr>
<td>Outpatient laparoscopy</td>
<td>Placebo</td>
<td>138</td>
<td>↓ PONV, antiemetic drug requirements, and time to discharge</td>
</tr>
<tr>
<td>Major gynecologic</td>
<td>Placebo</td>
<td>42</td>
<td>↓ PONV in first 24 h postop</td>
</tr>
<tr>
<td>Major gynecologic</td>
<td>Placebo</td>
<td>32</td>
<td>↓ Nausea in first 24 h postop and antiemetic drug requirements</td>
</tr>
<tr>
<td>Intra-abdominal gynecologic</td>
<td>None (open label)</td>
<td>34</td>
<td>↓ Frequency and severity of PONV</td>
</tr>
<tr>
<td>Plastic or orthopedic</td>
<td>Placebo</td>
<td>190</td>
<td>↓ PONV in first 24 h postop and antiemetic drug requirements</td>
</tr>
<tr>
<td>Otoplasty</td>
<td>Atropine</td>
<td>50</td>
<td>↓ PONV</td>
</tr>
<tr>
<td>Ear (outpatient)</td>
<td>Placebo</td>
<td>39</td>
<td>↓ Nausea and vertigo after discharge</td>
</tr>
<tr>
<td>Middle ear (inpatient)</td>
<td>Placebo</td>
<td>60</td>
<td>↓ PONV</td>
</tr>
</tbody>
</table>

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**References:**

# TDS Quantitative Review of Efficacy

**Comparison:** 02 Overall interval (0-24 hr)

**Outcome:** 01 Postoperative vomiting

<table>
<thead>
<tr>
<th>Study</th>
<th>Scopolamine n/N</th>
<th>Control n/N</th>
<th>RR (95% CI Random)</th>
<th>Weight %</th>
<th>RR (95% CI Random)</th>
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<tbody>
<tr>
<td>Tolksdorf 1996</td>
<td>0/30</td>
<td>7/29</td>
<td></td>
<td>0.3</td>
<td>0.6 (0.00, 1.08)</td>
</tr>
<tr>
<td>Honkavaara 1994</td>
<td>3/30</td>
<td>13/30</td>
<td></td>
<td>1.5</td>
<td>0.23 (0.07, 0.73)</td>
</tr>
<tr>
<td>Horimoto 1991</td>
<td>4/25</td>
<td>12/25</td>
<td></td>
<td>2.1</td>
<td>0.33 (0.12, 0.89)</td>
</tr>
<tr>
<td>Honkavaara 1995</td>
<td>4/25</td>
<td>12/25</td>
<td></td>
<td>2.1</td>
<td>0.33 (0.12, 0.89)</td>
</tr>
<tr>
<td>Lazar 1984</td>
<td>4/16</td>
<td>9/19</td>
<td></td>
<td>2.1</td>
<td>0.53 (0.20, 1.40)</td>
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<tr>
<td>Koski 1990</td>
<td>7/127</td>
<td>9/130</td>
<td></td>
<td>2.2</td>
<td>0.80 (0.31, 2.07)</td>
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<tr>
<td>Stromberg 1991</td>
<td>6/59</td>
<td>15/58</td>
<td></td>
<td>2.6</td>
<td>0.39 (0.16, 0.94)</td>
</tr>
<tr>
<td>Tarkkila 1995</td>
<td>5/20</td>
<td>11/20</td>
<td></td>
<td>2.7</td>
<td>0.45 (0.19, 1.07)</td>
</tr>
<tr>
<td>Uppington 1986</td>
<td>8/19</td>
<td>13/19</td>
<td></td>
<td>5.4</td>
<td>0.62 (0.33, 1.13)</td>
</tr>
<tr>
<td>Tigerstedt 1988</td>
<td>13/32</td>
<td>19/32</td>
<td></td>
<td>7.8</td>
<td>0.68 (0.41, 1.14)</td>
</tr>
<tr>
<td>Semple 1992</td>
<td>16/37</td>
<td>16/30</td>
<td></td>
<td>8.1</td>
<td>0.81 (0.49, 1.33)</td>
</tr>
<tr>
<td>Sohl 1994</td>
<td>17/43</td>
<td>24/47</td>
<td></td>
<td>9.3</td>
<td>0.77 (0.49, 1.23)</td>
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<tr>
<td>Wilkinson 1989</td>
<td>24/95</td>
<td>36/95</td>
<td></td>
<td>10.8</td>
<td>0.67 (0.43, 1.03)</td>
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<tr>
<td>Kotelko 1989</td>
<td>33/102</td>
<td>53/101</td>
<td></td>
<td>17.7</td>
<td>0.62 (0.44, 0.86)</td>
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<tr>
<td>Eberhart 1996</td>
<td>47/130</td>
<td>70/133</td>
<td></td>
<td>25.6</td>
<td>0.69 (0.52, 0.91)</td>
</tr>
<tr>
<td>Total (95% CI)</td>
<td>191/790</td>
<td>319/793</td>
<td></td>
<td>100.0</td>
<td>0.63 (0.55, 0.73)</td>
</tr>
</tbody>
</table>

Test for heterogeneity chi-square = 13.48 df = 14 p = 0.49
Test for overall effect z = 6.38 p < 0.00001

Nonpharmacologic Strategies

- Supplemental oxygen
- Perioperative rehydration
- Acupuncture, electroacupuncture, TENS, acupoint stimulation, acupressure
- Ginger
- Isopropyl alcohol
- Behavioral interventions: relief of anxiety, relaxation, guided imagery, therapeutic touch

Prophylactic Combinational Antiemetic Therapy

- “Gold Standard” for very high risk patients
  - Increased Efficacy
  - Improved Patient Satisfaction
  - Cost Effective
Common Prophylactic Multi-Modal Antiemetic Therapies

- Ondanestron & Droperidol
- Ondanestron & Droperidol
- Ondanestron & Transderm Scop
- Ondanestron & Dexamethasone
- Droperidol & Reglan
- Droperidol & Dexamethasone
The FDA has strengthened the warnings and precautions sections in the labeling for droperidol, a tranquilizer used most often as a premedication for anesthesia, as treatment for nausea after anesthesia, and for sedation of agitated patients. Droperidol has been associated with fatal cardiac arrhythmias.

Specific changes to the droperidol labeling include a "black box" warning, the most serious warning for an FDA-approved drug. The new warning is intended to increase the physician's focus on the potential for cardiac arrhythmias during drug administration, and to consider use of alternative medications for patients at high risk for cardiac arrhythmias.

Droperidol currently carries a warning about cases of sudden death at high doses (greater than 25 mg) in patients at risk for cardiac arrhythmias. Recent research has shown QT prolongation (delayed recharging of the heart between beats) within minutes after injection of a dose of droperidol at the upper end of the labeled dose range. Prolonged QT is dangerous because it can cause a potentially fatal heart arrhythmia known as torsades de pointes (TdP).

In the last year, there have been reports of TdP within or below the currently labeled dose range. There have also been reports of sudden death or other serious cardiac adverse events.

The FDA will continue to monitor the postmarketing safety data for droperidol to determine if further action is needed.

The manufacturer, Akorn Pharmaceuticals, is sending a "Dear Healthcare Professional" letter to physicians, pharmacists, and other healthcare professionals in the U.S. The letter explains the black box warnings and highlights the potential for QT prolongation or torsades when this drug is administered.

For more information, patients and healthcare providers can call Akorn Pharmaceuticals at 1-888-519-8384.

FDA Press Release
Dexamethasone

- Inhibition of prostaglandin synthesis is the proposed antiemetic mechanism action
- Increase in the release of endorphins results in mood elevation, a sense of “well-being”, and appetite stimulation.
- Many caveats to be aware of, should obtain consensus with surgeon
- Used heavily in CIE.

Ondansetron & Dexamethasone

Review of Recent Topics

- Timing Administration
- “Tron Wars”
- Repeat Dosing Versus Receptor Switch
- Opioid Induced Emesis and PONV
- Role of Complimentary and Alternative Medicine in PONV
- Incremental Costs
- Post Discharge PONV
Features of DUR and TDS

**Drug Utilization Review**
- Surrogate diagnosis is made based on the drug
- Initiated by the pharmacist
- Cost-saving focus
- Tries to reduced drug use
- Money saved due to reduced expenditure on drugs
- Alerts are in reaction to therapy chosen
- Occurs after patient visit to the physician

**Therapeutic Decision Support**
- The drug used is chosen on the basis of the physician’s diagnosis
- Initiated by the physician
- Patient-based focus
- Tries to increase appropriate drug use in order to solve underutilization
- Money saved is dependent on reduction in total healthcare costs of the patient
- Alerts influence in the choice of therapy
- Occurs at time of patient visit to the physician

## TDS in Practice

### Predictors
- Female
- Previous PONV
- Motion sickness
- Duration >60 min
- Non-smoker
- Laparoscopic GYN
- Breast Surgery
- Special Considerations

### Agents
- Ondansetron
- Dolasetron
- Promethazine
- Prochlorperazine
- Metoclopramide
- TD Scop
- Droperidol
- Benadryl
- Dexamethasone

Adapted from Blum, R. Clinical Researcher 2001;9:32-5.
## PONV Incidence & Management Tool

### Post-op Opioids

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>In</th>
<th>Post</th>
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<tbody>
<tr>
<td>Ondansetron</td>
<td>☐</td>
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<tr>
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<td>Promethazine</td>
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<td>Decadron</td>
<td>☐</td>
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<td>Scopolamine</td>
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<td>☐</td>
<td>☐</td>
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</tr>
<tr>
<td>Hydroxyzine</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>Prochlorperazine</td>
<td>☐</td>
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<tr>
<td>Atropine</td>
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</tr>
<tr>
<td>Ephedrine</td>
<td>☐</td>
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</tr>
</tbody>
</table>

### PACU Status:

- **Nausea**: [ ]
- **Emesis**: [ ]

### Intervention:

### Rx to Home:
Reasons to Avoid PONV

- A survey found that people* are willing to accept a variety of trade-offs to avoid PONV:
  - Dysphoria
  - Increased cost
  - Decreased mental acuity
  - Increased postoperative pain

*Anesthesiologists, nurses, support staff at two teaching hospitals, and computer personnel who attended a national meeting.

Currently in the U.S., > 60% of surgical procedures performed on an ambulatory basis.

Trend: Ever increasing number of ASC, office based anesthesia, and out patient surgeries.

One study: PONV 48 h after discharge 16.8% compared with incidence in PACU (9.8%)

Numbers may even be higher (30+%).

## Tramer’s Meta-Analysis

**PONV / OIE Management**

<table>
<thead>
<tr>
<th>Drug</th>
<th>NNT(95% CI)</th>
<th>NNT (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vomiting</td>
<td>Nausea and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vomiting</td>
</tr>
<tr>
<td>Droperidol</td>
<td>3.1 (2.3–4.8)</td>
<td>2.8 (2.1–3.9)</td>
</tr>
<tr>
<td>Transdermal Scopolamine</td>
<td>10 (2.9–infin)</td>
<td>5.4 (2.8–56)</td>
</tr>
<tr>
<td>Ondansetron</td>
<td>5.1 (2.8–23)</td>
<td>2.9 (21–4.7)</td>
</tr>
<tr>
<td>Tropisetron</td>
<td></td>
<td>4.7 (3.0–11)</td>
</tr>
<tr>
<td>Proprofol</td>
<td></td>
<td>-75 (-3.6–infin)</td>
</tr>
<tr>
<td>Metoclopramide</td>
<td></td>
<td>7.8 (3.4–infin)</td>
</tr>
<tr>
<td>Clonidine PO</td>
<td>2.3 (1.5–6.0)</td>
<td></td>
</tr>
<tr>
<td>Promethazine</td>
<td></td>
<td>2.5 (1.4–14)</td>
</tr>
</tbody>
</table>
Suggested OINV Treatment Strategies

- **Regimens**
  - Zofran 4mg at start of IV PCA, then maintain with
    - Benadryl 12.5 mg t.i.d x 24 hrs; or
    - Reglan 10 mg b.i.d x 24 hrs
  - Promethazine 12.5 mg added to morphine 1 mg/mL, = total of 17.6 mg over 24 hrs ? sedation
  - Clonidine (5 µg/kg) 1.5 hours before surgery and at 12 and 24 hours after the initial dose, with IV morphine PCA for pain management
  - Ondansetron—4 mg IV single dose and 8 mg (0.13 mg/mL)
  - Droperidol —0.15 mg/ml MS: watch total daily dose 5mg-60 mg
  - Perphenazine (1 mg - Trilafon) is especially useful for the prevention and treatment of PONV caused by opioids.
  - TDS as soon as possible.
Our Role

Multidisciplinary Team Approach

- “Perioperative Medicine”
- Pharmacist, MD, CRNA, RN…
- Outpatient SurgiCenters