

Resource 5: Management of Postoperative Nausea and Vomiting in all PeriAnesthesia Phases

Incidence, Pathophysiology, Assessment and Management in all PeriAnesthesia Phases

The incidence of postoperative nausea and vomiting ranges from approximately 25 percent (%) to as high as 38% of all clients in the first 24 hours of the postoperative period. It is the leading cause of client dissatisfaction, delays discharge from hospital and often results in unexpected admissions to hospital for surgical clients in the ambulatory setting (Chandrakantan, & Glass, 2011).

Postoperative nausea and vomiting can be designated as:

- Early, within 2 to 4 hours postoperatively,
- Late, after 6 to 24 hours postoperatively,
- Prolonged, occurring following discharge from the institution or 24 - 48 hours following surgical intervention.

Postoperative nausea and vomiting can present as nausea, with vomiting, or with retching, separately or in combination. (See Glossary for the variety of terms related to postoperative nausea and vomiting and their definitions).

1. Physiological mechanism of nausea and vomiting

- 1.1. Nausea and vomiting are caused by excitement of the emetic (vomiting) center, which is located in the medulla close to the dorsal nucleus of the vagus nerve.
- 1.2. The emetic center is rich in dopamine (D2), histamine, 5-hydroxytryptamine (serotonin or 5-HT), neurokinin-1 (NK1) and muscarinic-cholinergic receptors.
- 1.3. Stimulation of the emetic center by reflex impulses from the gastrointestinal tract, the cerebral centers close to the fourth cerebral ventricle, or the cerebral cortex and the vestibular center can lead to nausea and subsequently to vomiting.
- 1.4. Each of these centers has specific receptors that can be triggered by specific events or stimuli:
 - 1.4.1. The chemoreceptor trigger zone (CTZ), is located in the postrema area in the medulla,
 - 1.4.1.1. This zone is activated by chemicals carried in the blood and cerebral spinal fluid, such as opioids.
 - 1.4.1.2. It also has the greatest impact on the emetic center and can initiate vomiting independently when stimulated under the right conditions.
 - 1.4.2. The cerebral cortex is stimulated by emotions and stress responses,
 - 1.4.3. The endocrine environment triggers are related to female gender and pregnancy,
 - 1.4.4. The vestibular center is triggered by surgical intervention in the middle ear as well as movement following surgery and potentially opioids,
 - 1.4.5. In the gastrointestinal tract, stimulation of histamine and dopamine receptors in gut caused by such things as surgical manipulation, gastric distension or simple noxious chemical stimuli, leads to vagus nerve stimulation and activation of the vomiting center,
 - 1.4.6. Other vagal afferents such as stimulation by maneuvers of manipulation of the eye, or to the glossopharyngeal nerve following procedures such as tonsillectomies, activate dopamine, histamine and opioid receptors,
 - 1.4.6.1. These afferents may stimulate the nucleus tractus solitarius (NTS), a nerve bundle that lies close to the vagus nerve in the brain and plays a role in blood pressure, cough, gag and sneeze reflexes as well as vomiting. The NTS receptors are dopamine, serotonin (5-HT), histamine, acetylcholine (muscarinic-cholinergic) and neurokinin-1 (Drain, & Odom-Forren, 2009, p. 414).

2. Etiology, Risk Factors, and Risk Assessment Scoring Systems for Postoperative Nausea and Vomiting:

2.1. The etiologies for, and risk factors associated with postoperative nausea and vomiting are multifactorial and are generally classified into three factors:

2.1.1. Client:

- 2.1.1.1. Age,
- 2.1.1.2. Gender,
- 2.1.1.3. Non-smoking status,
- 2.1.1.4. Anxiety,
- 2.1.1.5. Acute pain from current surgical procedure,
- 2.1.1.6. Chronic pain and prolonged opioid use,
- 2.1.1.7. Presence of delayed gastric emptying such as in pregnancy, obesity, gastroesophageal reflux disease (GERD) and in some cases, diabetes (Hambridge, 2012),
- 2.1.1.8. Prolonged preoperative fasting (Enhanced Recovery after Surgery Society (See Appendix W),
- 2.1.1.9. History of motion sickness.

2.1.2. Anesthesia:

- 2.1.2.1. ASA physical status classification (the higher the ASA value, the lower the risk for postoperative nausea and vomiting),
- 2.1.2.2. Type of approach e.g., general anesthesia, type of induction agents, type of inhalation agents (nitrous oxide/volatile gases),
- 2.1.2.3. Gastric distension.

2.1.3. Surgical:

- 2.1.3.1. PeriAnesthesia opioid treatment,
- 2.1.3.2. Length of surgery,
- 2.1.3.3. Type of surgery,
- 2.1.3.4. Hypovolemia (Gustafsson, Scott, Schwenk, Demartines, Moulin, Francis, McNaught et al, 2012).

2.2. Risk Assessment Scoring Systems

2.2.1. A variety of tools such as the Apfel Score or the Koivuranta Score are available (See Table One) and can indicate the likelihood of postoperative nausea and vomiting by matching the number of risk factors with the incidence through proven performance in a variety of studies worldwide.

- 2.2.1.1. When using the Apfel Scoring tool that consists of four client factors (female gender, non-smoking status, history of motion sickness/postoperative nausea and vomiting, use of postoperative opioids), the risk increases with the addition of each additional factor (Gundzik, 2008).
- 2.2.1.2. As the number of risk factors increases, so does the incidence of postoperative nausea and vomiting.
- 2.2.1.3. The number preoperative prophylactic interventions are based on the results of the risk scoring tool and should increase with an increase in risk factors proportionately (See Table Two).

2.2.2. The common risk factors that are identified in most scoring tools are:

- 2.2.2.1. Female gender,
- 2.2.2.2. Non-smoking status,
- 2.2.2.3. History of motion sickness or postoperative nausea and vomiting,
- 2.2.2.4. Use of postoperative opioid treatment.

- 2.2.3. Other tools may also include:
 - 2.2.3.1. Surgery of greater than 60 minutes' duration,
 - 2.2.3.2. Age (highest incidence in 6 to 16 years old),
 - 2.2.3.3. Type of surgical procedure.

Table One: Simplified Tools for Assessment of Postoperative Nausea and Vomiting Risk

Apfel et al tool

Risk Factors	Points
Female gender	1
Non-smoker	1
History of postoperative nausea and vomiting /motion sickness	1
Postoperative opioids	1
Score = 0 . . . 4	

Source: Apfel, Läärä, Koivuranta, Greim, & Roewer, 1999

Koivuranta et al tool

Risk factors	Points
Non-smoker	1
Female gender	1
History of PONV	1
History of motion sickness	1
Duration of surgery >60 min	1
Score = 0 . . . 5	

Source: Koivuranta, Läärä, Snare, & Alahuhta, 1997

Table Two: Incidence of PONV in Relation to Number of Risk Factors

Number of Risk Factors Based on Apfel's Score	0	1	2	3	4
Incidence of postoperative nausea and vomiting	10% Low	20% Mild	40% Moderate	60% High	80% Extremely high
Number of interventions to consider (risk versus benefit) (Le & Gan, 2010)	0 to 1	0 to 1	1	2	3 or more

2.3. Postoperative Nausea and Vomiting Measurement Scales

- 2.3.1. Two main types of scales are used to ascertain the degree of nausea and/or vomiting experienced by the client.
- 2.3.2. Visual Analogue Scale (VAS) is a classical device with a scale from 0-10 indicating the

- severity of the symptoms from no nausea (0) to extremely high nausea (10).
- 2.3.3. Verbal Description Scale (VDS) is a 4-point scale with indicators: 0= no nausea; 1= mild; 2= moderate; and 3= severe nausea (Boogaert, Vanancker, Seidel, Albert, & Bardiau, 2000).
- 2.3.4. Benefits:
- 2.3.4.1. Both are easy to use
 - 2.3.4.2. Excellent for determining the severity of the disorder
 - 2.3.4.3. Both indicative of the efficacy of treatment following management.
- 2.4. **Prolonged Postoperative Nausea and Vomiting (PPONV)**
- 2.4.1. Prolonged postoperative nausea and vomiting or intractable postoperative nausea and vomiting occurs within approximately 30% to 50 % of clients.
- 2.4.2. Considered to be prolonged when it continues, or occurs after the first 24 to 48 hours following surgical intervention (Kovac, 2000).
- 2.4.3. Approximately 36% of the clients that experience this type of nausea and vomiting do not have any symptoms prior to discharge (Habib, & Gan, 2004).
- 2.4.4. In a recent review (Kovac, 2013), the causes of *prolonged* postoperative nausea and vomiting were found to be related to those similar to factors and risks identified in early postoperative nausea and vomiting.
- 2.4.5. Researchers have determined those risk factors to be:
- 2.4.5.1. Age over 50 years,
 - 2.4.5.2. Female gender,
 - 2.4.5.3. History of postoperative nausea and vomiting,
 - 2.4.5.4. Opioids given in PACU,
 - 2.4.5.5. Nausea in PACU.
- 2.4.6. The risk prediction model suggests that the number of risk factors can predict accurately the incidence of prolonged postoperative nausea and vomiting as in Table Three.

Table Three: Risk Prediction for Prolonged Postoperative Nausea

Number of risk factors	0	1	2	3	4	5
Incidence of <i>prolonged postoperative nausea and vomiting</i> (PPONV)	10%	20%	30%	50%	60%	70%

- 2.4.7. Prevention
- 2.4.7.1. In light of the high incidence of postoperative nausea and vomiting in the postoperative population and the related costs to the client and the healthcare system, prevention is the goal:
- 2.4.7.2. It is more effective to prevent than treat nausea and vomiting, which includes:
- 2.4.7.2.1. Assessment of factors relating to postoperative nausea and vomiting,
 - 2.4.7.2.2. Early intervention,
- 2.4.7.3. Treatment using a multimodal approach combining pharmacological and non-pharmacological therapies as the standard for managing and preventing postoperative nausea and vomiting.

2.5. **Pharmacological Antiemetics**

- 2.5.1. Antiemetic medications affect multiple receptors and are grouped accordingly.
- 2.5.2. In a 2006 Cochrane review, results of multiple studies showed that no single drug was

- better than another.
- 2.5.3. When drugs were given together, their effects were additive and overall the side effects were minimal (Kovac, 2013).
- 2.5.4. Corticosteroids (e.g., Dexamethasone) in combination with a 5-HT₃ antiemetic (e.g. ondansetron/zofran®, granisetron/kytril®) in the Pre-anesthesia/Anesthesia phases has been effective in preventing postoperative nausea and vomiting.
- 2.5.4.1. Although the mechanism is unknown, it is believed that dexamethasone acts to inhibit prostaglandin synthesis or to control endorphin release (Le, & Gan, 2010).
- 2.5.4.2. In combination with 5-HT₃ receptor antagonists, corticosteroids have a threefold action:
- 2.5.4.2.1. Reduce the level of serotonin by depleting tryptophan,
 - 2.5.4.2.2. Prevent the release of serotonin,
 - 2.5.4.2.3. Sensitize the 5-HT₃ receptors to other antiemetics.
- 2.5.5. 5-HT₃ receptor antagonists (e.g., ondansetron, granisetron)
- 2.5.5.1. Act by inhibiting serotonin,
 - 2.5.5.2. Are often used as the first line of prophylaxis medications for prevention of postoperative nausea and vomiting,
 - 2.5.5.3. Side effects are minimal and usually short term.
 - 2.5.5.4. To be avoided in patients who have Long QT Syndrome
 - 2.5.5.5. Le and Gan (2010) found that in the science of pharmacogenetics, a small percent of the population metabolizes 5-HT₃ antagonists ultra-fast, therefore rendering these medications ineffective.
- 2.5.6. Anticholinergic antagonists (e.g., scopolamine)
- 2.5.6.1. Are the oldest of the antiemetics and block muscarinic cholinergic receptors,
 - 2.5.6.2. more side effects than 5-HT₃ medications, but in the postoperative period have been found to be as effective (Kovac, 2013).
- 2.5.7. Butyrophenones (e.g., haloperidol and droperidol)
- 2.5.7.1. Are a class of dopamine receptor antagonists that was widely used for the treatment of postoperative nausea and vomiting until warnings were issued regarding the side effects of droperidol (trade name Inapsine ®) linked to rare cases of sudden cardiac deaths related to:
 - 2.5.7.1.1. Delayed repolarization of the myocardium with resultant prolongation of the QT interval
 - 2.5.7.1.2. Other serious cardiac arrhythmias (e.g., torsades de pointes [TdP]) (Kovac, 2013; U.S. Federal Drug Administration, 2001; Health Canada, 2002)
 - 2.5.7.1.3. Health Canada has since allowed limited use of the butyrophenones to those who are not predisposed to prolonged QT intervals (greater than 0.44), electrolyte imbalances, those with liver or renal disease, Parkinson's disease or epilepsy, or those who take medications that affect electrolytes or QT intervals (Wooltorton, 2002).
 - 2.5.7.1.4. Droperidol is again being utilized as an effective medication in young people with no cardiac disease or electrolyte imbalances, for the use of postoperative nausea and vomiting and is cost effective
 - 2.5.7.1.5. Other major side effects of the butyrophenones are sedation and extrapyramidal symptoms (e.g., restlessness, akathisia, dystonia) with high doses and/or rapid administration.
- 2.5.8. Dimenhydrinate and diphenhydramine are effective on the histamine and dopamine receptors and are effective for clients undergoing surgery affecting the vestibular apparatus.

- 2.5.8.1. Most common major adverse effects of these drugs are:
 - 2.5.8.1.1. Sedation,
 - 2.5.8.1.2. Blurred vision,
 - 2.5.8.1.3. Dry mouth,
 - 2.5.8.1.4. Urinary retention.
- 2.5.9. Neurokinin-1 receptor antagonist medications (e.g. Aprepitant or Emend[®] [trade name]).
 - 2.5.9.1. Are a newer class of medications more commonly used in cancer treatment-induced nausea (Cancer Care Ontario, 2013).
 - 2.5.9.2. Are generally very well tolerated and are available in oral or intravenous administration.
 - 2.5.9.3. A benefit for use of this medication is the extended period of effectiveness from 24 to 48 hours (Hargreaves, 2011).
 - 2.5.9.4. It is recommended that it be started 3 hours before induction of anesthesia to be effective postoperatively.
 - 2.5.9.5. Aprepitant is superior to ondansetron for prevention of vomiting in the first 24 and 48 hours, but no significant differences can be observed between aprepitant and ondansetron for nausea control, use of rescue, or complete response (Gan, Apfel, Kovac, Philip, Singla, Minkowitz, Habib et al, 2007a).
- 2.5.10. Oxygen is inconclusive for results as a treatment for postoperative nausea and vomiting (no difference in postoperative nausea and vomiting or antiemetic use between clients receiving oxygen and those who do not) (Le, & Gan, 2010).
 - 2.5.10.1. "Analysis of data on the efficacy of intraoperative supplements of oxygen on the prevention of postoperative nausea and vomiting has been conflicting and this intervention currently is not recommended" (Collins, 2011).

2.6. Adjuvant Pharmacological Antiemetics

- 2.6.1. Other medications are used for nausea and may be beneficial to some degree.
 - 2.6.1.1. Metoclopramide is one example which acts by blocking dopamine receptors and is useful in preventing delayed gastric emptying due to opioids, but it is limited in its effectiveness due to the relative short half-life of 30 to 45 minutes.
 - 2.6.1.2. Ephedrine, frequently used for hypotension, is known to have some possible antiemetic properties.
 - 2.6.1.2.1. It is effective for approximately three hours, with onset of action in 10 to 20 minutes, peaking in one hour.
 - 2.6.1.2.2. It works by potentially minimizing hypotension.
 - 2.6.1.2.3. Studies have been conducted on both hypotensive and normotensive clients with similar results for relief of postoperative nausea and vomiting (Wuhrman, & Clark, 2011).

2.7. Correct Use of Multiple Pharmacological Antiemetic Medications

- 2.7.1. In the event that the prophylactic treatments for postoperative nausea and vomiting fail in the PACU, it is recommended that a new antiemetic from a different class, not previously given, be administered. Medications from the same class may be given if the occurrence of postoperative nausea and vomiting is over six hours

since the last dose.

2.7.2. For a complete list of Antiemetics, with most effective timing of administration, dosages and side effects, see Table Four.

2.7.3. See also Illustration One: Postoperative Nausea and Vomiting Management Algorithm, and Illustration Two: PONV Prevention and Treatment Algorithm.

Table Four: Antiemetic Doses and Timing for Prevention of Postoperative Nausea and Vomiting (PONV) in Adults

Drugs	Dose	Timing	Adverse Effects
Aprepitant	40 mg PO	0 - 3 hours prior to induction of anaesthesia	Headache, fatigue, dizziness elevated liver enzymes
Dexamethasone	5- 10 mg IV	At/before induction	Vaginal itching or anal irritation with IV bolus
Diclectin 10 mg doxylamine succinate and 10 mg pyridoxine hydrochloride		Before induction Prior evening, 2 tablets; Before induction, morning of surgery, 1 tablet; After surgery, 1 tablet	
Dimenhydrinate	25-50mg IV		Sedation, dry mouth, blurred vision, dizziness, urinary retention
Dolasetron	12.5 mg IV	End of surgery; timing may not affect efficacy	Headache, lightheadedness, elevated liver enzymes
Droperidol	0.625–1.25 mg IV	End of surgery	Sedation, dizziness, anxiety, hypotension, EPS Delayed re-polarization of the myocardium, prolonged QT
Ephedrine	0.5 mg/kg IM	End of surgery	
Granisetron	0.35–1.5 mg IV	End of surgery	Headache, lightheadedness, elevated liver enzymes
Haloperidol	0.5–2 mg IM/IV		Delayed re-polarization of the myocardium, prolonged QT
Metoclopramide	5-10 mg IV for prophylaxis		Sedation, hypotension, EPS
Prochlorperazine	5–10 mg IM/IV	End of surgery	Sedation, hypotension, EPS
Promethazine	6.25–25 mg IV	At induction	Sedation, hypotension, EPS
Ondansetron	4 - 8 mg IV	End of surgery	Headache, lightheadedness, elevated liver enzymes, prolonged QT

Scopolamine Transdermal patch		Prior evening or 2 hours before surgery	Sedation, dry mouth, visual disturbances; CNS effects in elderly clients, renal or hepatic impairment
Tropisetron	2 - 5 mg IV	End of surgery	Headache, lightheadedness, elevated liver enzymes

Adapted from: Gan, Meyer, Apfel, Chung, Davis, Habib, Hooper, et al, 2007b; McCracken, Houston, & Lefebvre, 2008; Gan, Diemunsch, Habib, Kovac, Kranke, Meyer, Watcha, et al, 2014.

Illustration One: Postoperative Nausea and Vomiting Management Algorithm

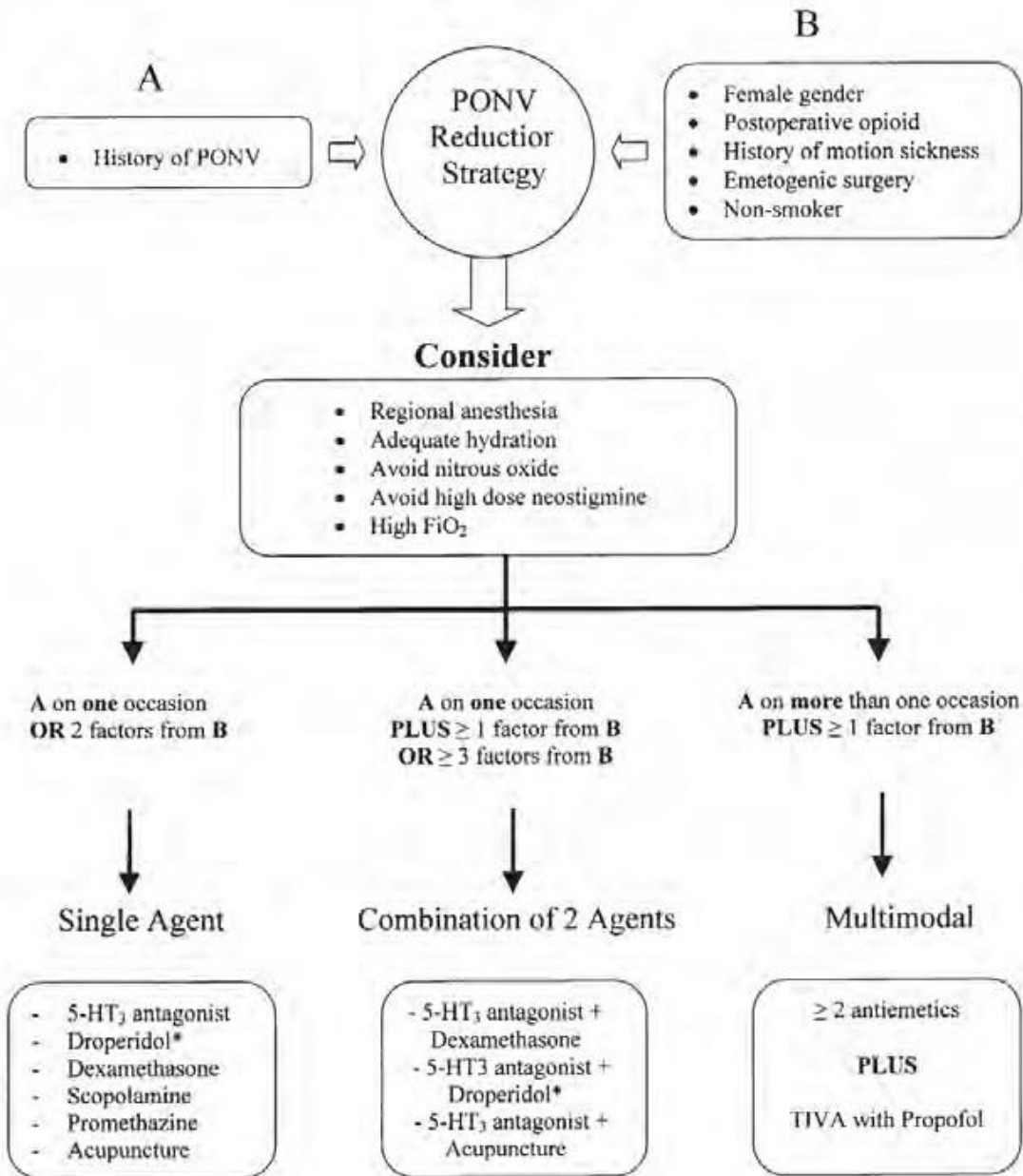
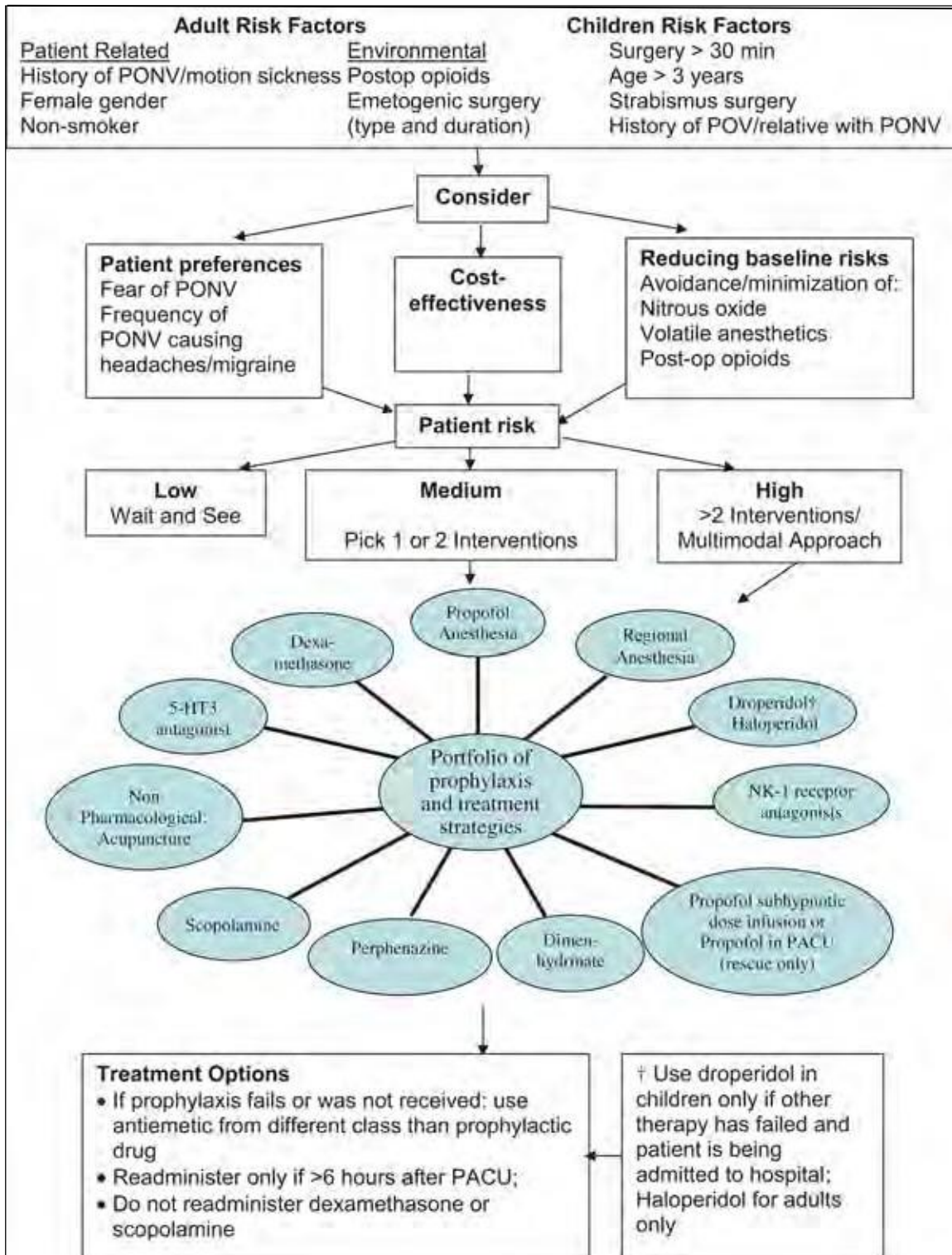


FIGURE PONV – postoperative nausea and vomiting; Emetogenic surgery – surgery with a high risk for PONV e.g., intra abdominal surgery, gynecologic surgery, breast surgery, strabismus surgery, and ENT surgery. * Consider the FDA “black box” warning on droperidol.

Source: Habib, & Gan, 2004

Illustration Two: PONV Prevention and Treatment Algorithm



Source: Gan, Diemunsch, Habib, Kovac, Kranke, Meyer, Watcha, et al, 2014.

2.8. Non-pharmacological Antiemetics

2.8.1. There are a variety of non-pharmacological interventions that may be implemented for client comfort. These interventions have become a reasonable adjunct to conventional therapies

2.8.1.1. Acupuncture:

- 2.8.1.1.1. The most studied of all of the non-pharmacological techniques.
- 2.8.1.1.2. The mechanism is not clear but it is thought that acupuncture influences neurotransmission in the dorsal horn or other centers promoting endorphins, or inhibiting gastric acid secretion or normalizing gastric emptying.
- 2.8.1.1.3. Pressure is applied to the P6 (point 6) acupuncture point, located 4 cm from the wrist crease (mid-centre between the ulna and radius on the palmar side of the wrist) using acupuncture, acupressure, and electrical stimulation or pressure bands (Le, & Gan, 2010).

2.8.1.2. Isopropyl alcohol inhalation:

- 2.8.1.2.1. Appears that isopropyl alcohol influences the neurotransmitters in the CTZ.
- 2.8.1.2.2. Some evidence indicates that it is not more effective than other aromatherapies or than having the client take deep breathes.
- 2.8.1.2.3. In the PACU, inhaling isopropyl alcohol has had some success in the short term relief of symptoms (Kovac, 2013; Pellegrini, DeLoge, Bennett, & Kelly, 2009).
- 2.8.1.2.4. Further study is required (Ferruggiari, Ragione, Rich, & Lock, 2012).

2.8.1.3. Aromatherapy:

- 2.8.1.3.1. Another nontraditional treatment,
- 2.8.1.3.2. Involves the inhalation of essential oils such as peppermint.
- 2.8.1.3.3. These oils are lipophilic and are absorbed through the nasal mucosa and absorbed by the brain and nervous system.
- 2.8.1.3.4. Further study is needed (Ferruggiari et al, 2012).

2.9. Prophylactic Multimodal Antiemetic Treatments

2.9.1. In addition to the above interventions in those clients that are at high risk of postoperative nausea and vomiting, additional multimodal approaches can be used, which include, but are not limited to:

2.9.1.1. Adequate hydration,

2.9.1.2. Includes pre-hydration with high carbohydrate clear fluids orally,

2.9.1.3. Ingested a minimum of 2 hours preoperatively (See Appendix W),

2.9.1.4. Adequate fluid volumes may correct hypotension, which is one cause of nausea and vomiting.

2.9.1.5. Regional anesthesia when available for those clients at high risk,

2.9.1.5.1. Total intravenous anesthesia (TIVA) with propofol and avoidance of nitrous oxide and inhalation agents,

2.9.1.5.2. Propofol has a direct antiemetic effect that lasts up to 30 minutes after discontinuation (Chandrakantan, 2011),

2.9.1.5.3. Anxiolytics,

2.9.1.5.4. Short-acting opioids with TIVA or use of non-steroidal anti-inflammatory drugs.

3. Management of Postoperative Nausea and Vomiting by PeriAnesthesia Phase

3.1. PreOperative/PreAdmission Phase

3.1.1. During the PreOperative/PreAdmission phase, it is important for the PeriAnesthesia nurse to collect, interpret, and report data and develop a plan of care that follows the client throughout all phases, as identified in Resource 1.

3.1.2. In addition, the PeriAnesthesia nurse will:

- 3.1.2.1. Complete appropriate documentation for predicting the risk of postoperative nausea and vomiting by:
 - 3.1.2.1.1. Interviewing the client for risk factors (e.g., gender, age, history),
 - 3.1.2.1.2. Assign and document a risk score using an appropriate risk assessment scoring system,
 - 3.1.2.1.3. Notify appropriate interprofessional team members,
 - 3.1.2.1.4. Notify the anesthesiologist if risk score is moderate to high (Apfel Score of 3 or greater, or an elevated score as per another scoring system),
 - 3.1.2.1.5. Obtain a physician's direction or prescription for the necessary prophylactic antiemetic and provide clients with instructions on the correct administration prior to arrival at the institution on the Day of Surgery.
- 3.1.2.2. Provide sufficient time for an opportunity for the client/family/caregiver to discuss:
 - 3.1.2.2.1. Comfort assessment and measures e.g., history of postoperative nausea and vomiting, positioning, previous experiences and successful treatments.
 - 3.1.2.2.2. Family/caregiver/client teaching in regards to reporting of nausea intensity using an appropriate risk assessment document relevant to cognitive understanding.
 - 3.1.2.2.2.1. Visual analog scales for nausea (Boogaert et al, 2000)
 - 3.1.2.2.2.1.1. 0-1, no nausea
 - 3.1.2.2.2.1.2. 1+ to 4, mild
 - 3.1.2.2.2.1.3. 4+ to 7, moderate
 - 3.1.2.2.2.1.4. 7+ to 10, severe.
 - 3.1.2.2.2.2. Verbal descriptive scales for nausea (Boogaert et al, 2000)
 - 3.1.2.2.2.2.1. 0, no nausea
 - 3.1.2.2.2.2.2. 1, mild
 - 3.1.2.2.2.2.3. 2, moderate
 - 3.1.2.2.2.2.4. 3, severe.
 - 3.1.2.2.3. Discuss options for management of nausea and vomiting in all phases.
 - 3.1.2.2.4. Discuss availability of alternative therapies that may be requested or used by clients e.g., acupuncture, aromatherapy, relaxation therapy.
 - 3.1.2.2.5. Standardized approach for documentation and communication of all relevant information as outlined by Accreditation Canada (2014b) and in accordance with the institution's policies, procedures and protocols.
 - 3.1.2.2.6. Use of a standardized approach for a comprehensive transfer of information to other members of the interprofessional team members.

3.2. During the Day of Surgery Phase

- 3.2.1. The PeriAnesthesia nurse continues to assess and manage the client's needs by reviewing, assessing and updating the plan of care before transfer to the next phase. This provides opportunity for the nurse to reinforce teaching strategies with the client, identify gaps in knowledge and establish realistic goals for management of postoperative nausea and vomiting.
- 3.2.2. In addition to Resource 1: Client Assessment, Data Collection and Management in all Phases of the PeriAnesthesia Environment, and Resource 4: Assessment and Management of PeriAnesthesia Pain, the PeriAnesthesia nurse will:
 - 3.2.2.1. Review previous score or if not previously recorded, complete appropriate documentation for predicting the risk of postoperative nausea and vomiting and

- 3.2.2.1.1. Interviewing client for risk factors e.g., gender, age, history,
- 3.2.2.1.2. Assign a risk score using an appropriate risk assessment system.
- 3.2.2.2. Notify appropriate interprofessional team members.
- 3.2.2.3. Notify the anesthesiologist if risk score is moderate to high (Apfel Score of 3 or greater, or an elevated score as per another scoring system).
- 3.2.2.4. Obtain a direction for a prophylactic antiemetic and administer as appropriate.
- 3.2.2.5. Provide sufficient time for the client/family/caregiver to discuss:
 - 3.2.2.5.1. Comfort assessment and measures e.g., history of postoperative nausea and vomiting, positioning, previous experiences and successful treatments.
 - 3.2.2.5.2. Family/caregiver/client teaching in regards to reporting of nausea intensity using an appropriate risk assessment document related to cognitive understanding,
 - 3.2.2.5.2.1. Visual analog scales for nausea (Boogaert et al, 2000)
 - 3.2.2.5.2.1.1. 0-1, no nausea
 - 3.2.2.5.2.1.2. 1+ to 4, mild
 - 3.2.2.5.2.1.3. 4+ to 7, moderate
 - 3.2.2.5.2.1.4. 7+ to 10, severe.
 - 3.2.2.5.2.2. Verbal descriptive scales for nausea (Boogaert et al, 2000)
 - 3.2.2.5.2.2.1. 0, no nausea
 - 3.2.2.5.2.2.2. 1, mild
 - 3.2.2.5.2.2.3. 2, moderate
 - 3.2.2.5.2.2.4. 3, severe.
- 3.2.2.6. Review/implement management of nausea and/or vomiting.
- 3.2.2.7. Implement strategies to manage postoperative nausea and vomiting.
- 3.2.2.8. Review/implement alternative therapies that may be requested and/or used by clients e.g., acupuncture, aromatherapy, relaxation therapy.
- 3.2.2.9. Standardized approach for documentation and communication of all relevant information as outlined by Accreditation Canada (2014b) and in accordance with the institution's policies, procedures and protocols.
- 3.2.2.10. Use of a standardized approach for a comprehensive transfer of information to other members of the interprofessional team.

3.3. Anesthesia Phase

- 3.3.1. During this phase the PeriAnesthesia nurse works in collaboration with the interprofessional team to provide the transition between Day of Surgery phase and the Anesthesia phase, and following anesthesia, with Phase I. This includes activities such as initiation and support of multimodal therapy for nausea and vomiting.
- 3.3.2. At the time of transfer of information, the PeriAnesthesia nurse will:
 - 3.3.2.1. Integrate data received at transfer of care as which will include, but is not limited to:
 - 3.3.2.1.1. Relevant preoperative and preanesthesia status,
 - 3.3.2.1.2. Review documents appropriate for assessment of postoperative nausea and vomiting,
 - 3.3.2.1.3. Integrates history of postoperative nausea and vomiting and previous effective treatment(s) into the plan of care.
 - 3.3.2.2. Support the client's use of the appropriate risk assessment document relative to cognitive understanding.

3.3.2.3. Implementation and use of nausea reporting scales

- 3.3.2.3.1. Visual analog scales for nausea (Boogaert et al, 2000)
 - 3.3.2.3.1.1. 0-1, no nausea
 - 3.3.2.3.1.2. 1+ to 4, mild
 - 3.3.2.3.1.3. 4+ to 7, moderate
 - 3.3.2.3.1.4. 7+ to 10, severe.
- 3.3.2.3.2. Verbal descriptive scales for nausea (Boogaert et al, 2000)
 - 3.3.2.3.2.1. 0, no nausea
 - 3.3.2.3.2.2. 1, mild
 - 3.3.2.3.2.3. 2, moderate
 - 3.3.2.3.2.4. 3, severe.

3.3.2.4. Assists with the implementation of the appropriate multimodal plan to manage postoperative nausea and vomiting, based on client reporting and objective and subjective descriptors

- 3.3.2.4.1. Use of antiemetics and adjuvant medications,
- 3.3.2.4.2. Use of comfort measures,
- 3.3.2.4.3. Psychospiritual supports,
- 3.3.2.4.4. Continue alternative therapies that may be requested/used by clients e.g., relaxation therapy, aromatherapy, acupuncture.

3.3.2.5. Provides a safe transfer of care communication report of all significant events in the Anesthesia phase to the interprofessional members in Phase I. A concise and comprehensive verbal transfer of care report is given to the PeriAnesthesia nurse in the next phase of care in accordance with the institution's accepted transfer of care communication template as a guide (Accreditation Canada, 2014b).

3.4. Phase I

3.4.1. The PeriAnesthesia nurse will continue to integrate data received during the transfer of care from all previous phases.

3.4.2. Integrate data received at transfer of care as identified in Resource 1, relevant preoperative and perianesthesia status:

- 3.4.2.1. History of postoperative nausea and vomiting, and incorporating this into the plan of care for assessment of risk factors for postoperative nausea and vomiting,
- 3.4.2.2. Prophylactic treatment of postoperative nausea and vomiting in the previous phases i.e., Day of Surgery and Anesthesia phases.

3.4.3. Assist with the implementation of the appropriate multimodal plan to manage postoperative nausea and vomiting, based on client's report and objective and subjective descriptors.

- 3.4.3.1. Use of antiemetic and adjuvant medications.
- 3.4.3.2. Alternative pharmacological treatments from a different class than the one used preemptively.
- 3.4.3.3. Medications from the same class may be given if there is a reoccurrence of postoperative nausea and vomiting after six hours since the first dose.
- 3.4.3.4. Use of comfort measures.
- 3.4.3.5. Psychospiritual supports.
- 3.4.3.6. Continue alternative therapies that may be requested and/or used by clients e.g., relaxation therapy, aromatherapy, acupuncture.

3.4.4. Implements and supports the client's use of the appropriate risk assessment document relative for cognitive understanding:

- 3.4.4.1. Visual analog scales for nausea (Boogaert et al, 2000)
 - 3.4.4.1.1. 0-1, no nausea

- 3.4.4.1.2. 1+ to 4, mild
- 3.4.4.1.3. 4+ to 7, moderate
- 3.4.4.1.4. 7+ to 10, severe.
- 3.4.4.2. Verbal descriptive scales for nausea (Boogaert et al, 2000)
 - 3.4.4.2.1. 0, no nausea
 - 3.4.4.2.2. 1, mild
 - 3.4.4.2.3. 2, moderate
 - 3.4.4.2.4. 3, severe.
- 3.4.4.3. Provides a safe transfer of care communication report of all significant events in all previous phases. A concise and comprehensive verbal transfer of care report is given to the PeriAnesthesia nurse in the next phase of care in regard to comfort requirements and measures taken with resultant effect (Accreditation Canada, 2014b).

3.5. Phase II

3.5.1. During Phase II and in preparation for transition to Extended Observation, the PeriAnesthesia nurse is responsible for ongoing assessment as identified in Resource 1.

3.5.2. Initial assessment, management criteria, and documentation should include:

- 3.5.2.1. Integration of data received at transfer of care.
- 3.5.2.2. Postoperative nausea and vomiting management, interventions and plan of care.
- 3.5.2.3. Use of antiemetics and adjuvant medications in previous phases, including dosages and times of administration.
- 3.5.2.4. Alternative pharmacological treatments from a different from class than the one used preemptively.
- 3.5.2.5. Medications from the same class may be given if there is a reoccurrence of postoperative nausea and vomiting after six hours since the first dose.
- 3.5.2.6. Promote and maintain effective postoperative nausea and vomiting management by decreasing movement, decreasing environmental stimulation such as noise, odours and by utilization of antiemetics and non-pharmacological supports.
- 3.5.2.7. Use of comfort measures.
- 3.5.2.8. Psychospiritual supports.
- 3.5.2.9. Continue alternative therapies that may be requested/used by clients e.g., relaxation therapy, aromatherapy, acupuncture.
- 3.5.2.10. Implements and supports the client's use of the appropriate risk assessment document relative for cognitive understanding
 - 3.5.2.10.1. Visual analog scales for nausea (Boogaert et al, 2000)
 - 3.5.2.10.1.1. 0-1, no nausea
 - 3.5.2.10.1.2. 1+ to 4, mild
 - 3.5.2.10.1.3. 4+ to 7, moderate
 - 3.5.2.10.1.4. 7+ to 10, severe.
 - 3.5.2.10.2. Verbal descriptive scales for nausea (Boogaert et al, 2000)
 - 3.5.2.10.2.1. 0, no nausea
 - 3.5.2.10.2.2. 1, mild
 - 3.5.2.10.2.3. 2, moderate
 - 3.5.2.10.2.4. 3, severe.

3.5.3. Ongoing assessment and management criteria and documentation include, but are not limited to:

- 3.5.3.1. Implement and maintain effective management of nausea and vomiting e.g., pharmacological and non-pharmacological.
- 3.5.3.2. Promote and maintain emotional comfort as required based on client self-reports and nonverbal indicators.
- 3.5.3.3. Administer medications as ordered and document response (Institute for Safe Medication Practices, 2008; Accreditation Canada, the Canadian Institute for Health Information, the Canadian Patient Safety Institute, & the Institute for Safe Medication Practices Canada, 2012).
- 3.5.3.4. Review of discharge instructions both written and verbal with client, family, escort as appropriate, may include but are not limited to:
 - 3.5.3.4.1. Guidelines for specific surgery to include postoperative nausea and vomiting assessment, medications (prescriptions) and understands the proper use of each medication, side effects and contraindications.
 - 3.5.3.4.2. Driving is not recommended for 24 hours following anesthesia and while taking opioid analgesics, which may be the cause of postoperative nausea and vomiting.
 - 3.5.3.4.3. Role of the escort, which may be divided between two or more individuals.
 - 3.5.3.4.4. Escort the client home and stay with the client at home as determined by discharge protocols.
 - 3.5.3.4.5. Assure compliance with postoperative instructions for taking antiemetics or use of other modalities.
 - 3.5.3.4.6. Monitor the client's progress towards recovery from postoperative nausea and vomiting.
 - 3.5.3.4.7. Contact physician or emergency care as required using parameters included in the postoperative discharge instructions should postoperative nausea and vomiting increase or become prolonged postoperative nausea and vomiting (PPONV) (Yun, Ip, & Chung, 2009).
- 3.5.4. Document nursing action and/or interventions with outcomes.
- 3.5.5. Ensure client meets discharge criteria for transfer to Extended Observation in the category of postoperative nausea and vomiting on a validated postanesthesia discharge scoring system (PADSS) (Chung, 1995).

3.6. Extended Observation

- 3.6.1. During the Extended Observation phase, the PeriAnesthesia nurse will:
 - 3.6.1.1. Continue ongoing assessment and management criteria and documentation which include, but are not limited to:
 - 3.6.1.1.1. Implement and maintain effective management of postoperative nausea and vomiting.
 - 3.6.1.1.2. Promote and maintain effective management of postoperative nausea and vomiting by decreasing movement, decreasing environmental stimulation such as noise, odours and by utilization of antiemetics and pharmacological and non-pharmacological supports.
 - 3.6.1.1.3. Promote and maintain emotional comfort as required based on client self-reports and nonverbal indicators
 - 3.6.1.1.4. Administer medications as ordered and document response (Institute for Safe Medication Practices, 2008;

Accreditation Canada, the Canadian Institute for Health Information, the Canadian Patient Safety Institute, & the Institute for Safe Medication Practices Canada, 2012).

- 3.6.1.1.5. Review discharge instructions both written and verbal with client, family, accompanying escort as appropriate which include, but are not limited to Guidelines for specific surgery to include postoperative nausea and vomiting assessment, medications (prescriptions) and understands the use of each medication, its side effects and contraindications for use.
- 3.6.2. Driving is not recommended for 24 hours following anesthesia and while taking opioid analgesics, which may be the cause of postoperative nausea and vomiting.
- 3.6.3. Role of the escort, which may be divided between two or more individuals:
 - 3.6.3.1. Escort the client home and stay with the client at home as determined by discharge protocols.
 - 3.6.3.2. Assure compliance with postoperative instructions for taking antiemetics or use of other modalities.
 - 3.6.3.3. Monitor the client's progress towards recovery from postoperative nausea and vomiting.
 - 3.6.3.4. Contact physician or emergency care as required using parameters included in the postoperative discharge instructions should postoperative nausea and vomiting become prolonged postoperative nausea and vomiting (PPONV) or increase (Yun et al, 2009).

References

Accreditation Canada. (2014a). *Perioperative services and invasive procedures standards*. Ottawa, ON: Accreditation Canada.

Accreditation Canada. (2014b). *Patient safety strategy. Part 3: Achieving safe care, 2012-2014*. Retrieved from <http://www.accreditation.ca/sites/default/files/patient-safety-strategy-en.pdf>

Accreditation Canada, the Canadian Institute for Health Information, the Canadian Patient Safety Institute, & the Institute for Safe Medication Practices Canada. (2012). *Medication Reconciliation in Canada: Raising the bar – Progress to date and the course ahead*. Ottawa, ON: Accreditation Canada.

Apfel, C., Läärä, E., Koivuranta, M., Greim, C., & Roewer, N. (1999). A simplified risk score for predicting postoperative nausea and vomiting: Conclusions from cross-validations between two centers. *Anesthesiology*, *91*(3), 693-700.

Boogaert, J., Vanancker, E., Seidel, L., Albert, A., & Bardiau, F. (2000). Assessment of postoperative nausea using a visual analog scale. *ACTA Anaesthesiologica Scandinavica*, *44*(4), 470-474.

Cancer Care Ontario. (2013). *Drug monograph: Aprepitant / Fosaprepitant*. Retrieved from https://www.cancercare.on.ca/CCO_DrugFormulary/Pages/DfPdfContent.aspx?itemId=94021

Chandrakantan, A., & Glass, P. (2011). Multimodal therapies for postoperative nausea and vomiting, and pain. *Br J Anaesth.*, *107*(Suppl 1), i27- 40. doi: 10.1093/bja/aer358

Chung, F. (1995). Discharge criteria: A new trend. *Canadian Journal of Anesthesia*, *42*, 1056–1058.

Collins, A. (2011). Postoperative nausea and vomiting in adults: Implications for critical care. *Critical Care Nurse*, *31*(6). Retrieved from <http://ccn.aacnjournals.org/content/31/6/36.full.pdf+html?sid=191cba2e-132b-4e0c-8db6-ef8835cec736>

Conway, B. (2009). Prevention and management of postoperative nausea and vomiting in adults. *AORN Journal*, *90*(3), 391-413. doi: 10.1016/j.aorn.2009.06.026

Drain, C., & Odom-Forren, J. (2017). *PeriAnesthesia nursing: A critical care approach* (7th ed.) (pp. 414-419). St. Louis, Missouri: Saunders Elsevier.

Ebell, M. (2007). Predicting postoperative nausea and vomiting. *American Family Physician*, *75*(10), 1537-1538. Enhanced Recovery after Surgery Society[®]. (2013). Available at <http://www.erassociety.org>

Ferruggiari, L., Ragione, B., Rich, E., & Losk, K. (2012). The effects of aromatherapy on postoperative nausea in women undergoing surgical procedures. *Journal of PeriAnesthesia Nursing*, *27*(4), 246-251.

Gan, T., Apfel, C., Kovac, A., Philip, B., Singla, N., Minkowitz, H., Habib, A., Knighton, J., Carides, A., Zhang, H., Horgan, K., Evans, J., Lawson, F., & The Aprepitant-PONV Study Group. (2007a). A randomized, double-blind comparison of the NK1 antagonist, aprepitant, versus

ondansetron for the prevention of postoperative nausea and vomiting. *Anesth Analg*, 104, 1082 - 1089.

Gan, T., Meyer, T., Apfel, C., Chung, F., Davis, P., Habib, A., Hooper, V., Kovac, A., Kranke, P., Myles, P., Philip, B., Samsa, G., Sessler, D., Temo, J., Tramèr, M., Vander Kolk, C., & Watcha, M. (2007b). Society for Ambulatory Anesthesia Guidelines for the Management of Postoperative Nausea and Vomiting: Consensus guidelines for the management of PONV. *Anesth Analg* 105, 1615 - 1628.

Gan, T., Diemunsch, P., Habib, A., Kovac, A., Kranke, P., Meyer, T., Watcha, M., et al. (2014). Consensus guidelines for the management of postoperative nausea and vomiting. *Anesthesia & Analgesia*, 118(1), 85-113. doi: 10.1213/ANE.0000000000000002

Gundzik, K. (2008). Nausea and vomiting in the ambulatory surgical setting. *Orthopedic Nursing*, 27(3), 182-188. doi: 10.1097/01.NOR.0000320547.43481.66

Gustafsson, U., Scott, M., Schwenk, W., Demartines, N., Moulin, D., Francis, N., McNaught, C. et al. (2012). Guidelines for perioperative care in elective colonic surgery: Enhanced Recovery After Surgery (ERAS[®]) Society recommendations. *Clinical Nutrition*, 31(6), 783-800. Retrieved from <http://download.journals.elsevierhealth.com/pdfs/journals/0261-5614/PIIS026156141200180X.pdf>

Habib, A., & Gan, T. (2004). Evidence-based management of postoperative nausea and vomiting: A review. *Canadian Journal of Anesthesia*, 51(4), 326 -341.

Hambridge, K. (2013). Assessing the risk of post-operative nausea and vomiting. *Nursing Standard*, 27(18), 35-43. Retrieved from:<http://www.ncbi.nlm.nih.gov/pubmed/23431652>

Hargreaves, R., Ferreira, J., Hughes, D., Brands, J., Hale, J., Mattson, B., & Mills, S. (2011). Development of Aprepitant, the first neurokinin-1 receptor antagonist for the prevention of chemotherapy-induced nausea and vomiting. *Ann N Y Acad Sci.*, 1222, 40-48. doi: 10.1111/j.1749-6632.2011.05961.x

Health Canada. (2002). *Therapeutic Products Directorate, Health Canada: Cardiovascular toxicity with injectable droperidol*. Retrieved from <http://www.hc-sc.gc.ca/hpb-dgps/therapeut/zfiles/english/advisory/tpd/droperidol-eng.php>

Institute for Safe Medication Practices. (2008). *Schools need to teach the 5 R's: Reading, Writing, Arithmetic, AND the Right medication at the Right time*. ISMP Medication Safety Alert![®] Community/Ambulatory Edition, August, 2-7. P. Horsham: Author. Retrieved from <http://www.ismp.org/newsletters/ambulatory/archives/200808.asp>

Koivuranta, M., Läärä, E., Snare, L., & Alahuhta, S. (1997). A survey of postoperative nausea and vomiting. *Anaesthesia*, 52, 443-449.

Kovac, A. (2000). Prevention and treatment of postoperative nausea and vomiting. *Drugs*, 59(2), 213-243. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/10730546>

Kovac, A. (2013). Update on management of postoperative nausea and vomiting. *Drugs*, 73(14), 1525-1547. doi: 10.1007/s40265-013-0110-7 Le, T., & Gan, T. (2010). Update on the management of postoperative nausea and vomiting and postdischarge nausea and vomiting in ambulatory surgery. *Anesthesiology Clin*, 28, 225-249. doi:10.1016/j.anclin.2010.02.003

McCracken, G., Houston, P., & Lefebvre, G. (2008). Guideline for the management of postoperative nausea and vomiting. *Journal of Obstetrics and Gynaecology Canada*, 209, 600 - 608.

Odom-Forren, J. (2013). *Drain's perianesthesia nursing: A critical care approach* (6th ed.). St. Louis, MO: Saunders Elsevier.

OR Manager. (2006). Consensus guide on preventing PONV. *OR Manager*, 22(12). Retrieved from <http://www.ormanager.com/wp-content/uploads/pdf/ORMVol22No12consensusOnPreventingPONV.pdf>

Pellegrini, J., DeLoge, J., Bennett, J., & Kelly, J. (2009). Comparison of inhalation of isopropyl alcohol vs promethazine in the treatment of postoperative nausea and vomiting (PONV) in patients identified as high risk for developing PONV. *American Association of Nurse Anesthetists Journal*, 7(4), 293-299. Retrieved from http://www.aana.com/newsandjournal/documents/comparison_inhalation_0809_p293-299.pdf

Schick, L., & Windle, P. (2010). *PeriAnesthesia nursing core curriculum. Preprocedure, Phase I and Phase II PACU nursing* (pp. 506-520). St Louis, MO: Saunders Elsevier.

U.S. Federal Drug Administration. (2001). *Home Safety Med Watch: The FDA safety information and adverse event reporting program safety information: Inapsine (droperidol): Dear healthcare professional letter, December 2001*. Retrieved from <http://www.fda.gov/safety/medwatch/safetyinformation/safetyalertsforhumanmedicalproducts/ucm173778.htm>

Wooltorton, E. (2002). Practice: Health and drug alerts. Droperidol: Cardiovascular toxicity and deaths. *Canadian Medical Association Journal*, 166(7), 932. Retrieved from <http://www.cmaj.ca/content/166/7/932.full.pdf>

Wuhrman, E., & Clark, M. (2011). Use of ephedrine for short-term treatment of postoperative nausea and vomiting: A case report. *Journal of PeriAnesthesia Nursing*, 26(5), 305-309.

Yun, H., Ip, V., & Chung, F. (2009). Escort accompanying discharge after ambulatory surgery: A necessity or a luxury? *Ambulatory Anesthesia*, 22, 748-754.