Clinical Practice Guideline for Postoperative Nausea and Vomiting Prevention

During Outpatient Surgery

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DNP Scholarly Project
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In 2006, of the 34.7 million ambulatory surgery visits nationwide, 19.9 million occurred in hospital settings (Cullen, Hall, & Golosinskiy, 2009). The rise in the number of surgeries being performed on an outpatient basis highlights the need for the use of a screening tool and a comprehensive postoperative nausea and vomiting (PONV) prevention guideline (Cullen, Hall, & Golosinskiy, 2009; Gan et al., 2014). Following discharge, ambulatory surgical patients have limited access to antiemetic treatment modalities (Apfel et al., 2010). Additionally, PONV can extend the length of stay in the post-anesthesia care unit (PACU), and is a common reason for unexpected hospital admission following outpatient surgery (Apfel et al., 2012a). Severe nausea and vomiting can be very debilitating, with serious complications including suture dehiscence, pulmonary aspiration, and esophageal rupture (Apfel et al., 2012). This can have a considerable economic impact on the cost of medical care (Kranke, Schuster, & Eberhart, 2007; Apfel et al., 2012a). In a study on the economic impact of PONV, it was revealed that PONV prophylaxis is economically beneficial for hospitals when weighed against the additional cost generated by readmissions to the hospital for unresolved PONV (Dzwonczyk, Weaver, Puente, & Bergese, 2012). In fact, Parra-Sanchez et al. (2012) determined that postoperative nausea and vomiting and post-discharge nausea and vomiting (PDNV) imposed an incremental cost of $75 per patient.

Despite improvements that have been achieved regarding the prevention and treatment of PONV, it continues to persist at a significant rate (Kovac, 2013). The overall incidence of PONV is approximately 25–30% in all surgical patients, and depending on the specific surgical procedure, the incidence of nausea ranges from 40–50 % and vomiting 25–30% (Kovac, 2013). With no prophylactic antiemetic, the incidence of PONV can be as high as 70–80% in certain
high-risk surgical patients (Kovac, 2013). Furthermore, in a study of patients undergoing general anesthesia at ambulatory surgery centers in the United States, it was determined that the overall incidence of post-discharge nausea and vomiting (PDNV) was 37% (Apfel et al., 2012a).

The setting for this scholarly project is an anesthesia department of a rural Mid-Atlantic hospital. Currently, this institution does not have an existing PONV screening tool or guideline available. Without an existing screening tool and guideline, at-risk patients whom could benefit from PONV prophylaxis, may not receive the necessary preventive interventions. Therefore, the purpose of this DNP scholarly project is to develop and evaluate an evidenced based clinical practice guideline (CPG) for PONV prevention, with a focus on screening and preoperative prevention. It is anticipated that anesthesia providers will endorse the CPG, with the goal of increasing the use of prophylactic treatment, and subsequently decreasing the incidence of PONV.

**Theoretical Framework**

The Theory of Symptom Management is the theoretical framework used for the development of this scholarly project. The major concepts of the Theory of Symptom Management include: symptom experience, symptom management strategies, and outcomes (Dodd et al., 2001). Under this theory, effective symptom management requires that all three concepts be taken into consideration (Dodd et al., 2001). The concepts of this theory will be utilized to guide the development of the CPG and selection of a preoperative screening tool.

The first concept, symptom experience, is the subjective perception, evaluation, and response to a symptom (Dodd et al., 2001). The way an individual responds to a symptom is dependent on demographical, physiological, psychological, sociocultural, and behavioral characteristics (Dodd et al., 2001). In order to successfully manage symptoms, evaluating the
interaction between these components of the symptom experience is necessary (Dodd et al., 2001). The goal of the second concept, symptom management, is to prevent or delay adverse outcomes, often through biomedical and professional strategies (Dodd et al., 2001). Management begins with assessment, followed by the development of a focus point for intervention strategies (Dodd et al., 2001). Intervention strategies may be directed at multiple components of the individual's symptom experience to achieve one or more desired outcomes (Dodd et al., 2001). Lastly, the outcomes concept results from symptom management strategies and symptom experience components (Dodd et al., 2001). If the symptom persists, symptom evaluation continues, along with ongoing assessment of the response to treatment (Dodd et al., 2001).

In applying the concepts of the Theory of Symptom Management to PONV, certain demographical characteristics, such as being female, predispose patients to the development of PONV (Apfel et al., 1999; Apfel et al., 2012b; Dodd et al., 2001). This is based on the concept of symptom experience. The existence of predisposing factors highlights the need for a reliable preoperative screening criteria for PONV. One of the assumptions of the Theory of Symptom Management model is that the symptom does not have to be present in order for the theory to be applicable (Dodd et al., 2001). The individual may simply be at risk for the development of the symptom, as in the case of identified high-risk patients for PONV (Dodd et al., 2001). Therefore, symptom management with preemptive antiemetics should be initiated prior to the onset of symptoms. By effectively identifying moderate-risk to high-risk patients preoperatively, it will lead to the implementation of preventative treatment modalities throughout the perioperative course and improved outcomes for patients following surgery (Apfel et al., 2012b; Gan et al., 2014).
Literature Review

Several studies have been conducted on the risk assessment and treatment of PONV. The intent of this literature review is to present current evidence regarding the identification and screening of PONV risk factors, as well as recommendations for preoperative PONV prevention and reduction of risk factors. See Appendix A for the complete review of the literature using The Johns Hopkins Nursing Evidence-based Practice Rating Scale.

To optimize prophylactic PONV interventions, a patient’s risk for the development of PONV should be objectively assessed using a validated risk score (Gan et al. 2014; Apfel, Läärä, Koivuranta, Greim, & Roewer, 1999). In original research, Apfel et al. (1999) constructed a simplified risk score using logistic regression analyses on data derived from two centers that independently developed a risk score for predicting PONV. The final simplified risk score consisted of four independent predictors of PONV: female gender ($p < 0.0001$), history of motion sickness or PONV ($p = 0.0003$), nonsmoking ($p < 0.0001$), and the use of postoperative opioids ($p = 0.0002$) (Apfel et al., 1999). The results of the study indicated that simplification did not weaken the discriminating power of the risk score (Apfel et al., 1999). Furthermore, if none, one, two, three, or four of these risk factors were present, the corresponding risk factor for the development of PONV was 10%, 21%, 39%, 61% and 79% respectively (Apfel et al., 1999). The results from this original study have been validated through more current research by Apfel and colleagues (2012a). In a systematic review and meta-analysis of 22 prospective studies, Apfel et al. (2012a) determined female gender was the strongest individual predictor of PONV ($p < 0.001$), followed by the history of PONV/motion sickness ($p < 0.001$), non-smoking status ($p < 0.001$), history of motion sickness ($p < 0.001$), and age ($p < 0.001$). Although existing data is suggestive that PONV is triggered by administration of emetogenic agents, many patients do not
end up experiencing PONV (Apfel et al., 2012a; Gan et al. 2014). This is because the development of PONV is also dependent on the patient’s susceptibility, which is based on individual factors (Gan et al. 2014). The evidence regarding other factors contributing to the development of PONV, such as surgical procedure is inconsistent, therefore inclusion of these factors may hinder objective assessment (Apfel et al., 2012a). From this information, it is shown that a patient’s risk for the development of PONV should be assessed using a validated risk score that is based on independent patient predictors that are most predictive of a patient developing PONV (Apfel et al., 1999; Apfel et al., 2012a; Gan et al., 2014). Furthermore, by using the Apfel et al. (1999) simplified risk score, the number and choice of prophylactic antiemetics can be tailored to the patient’s risk for PONV (Apfel et al., 2012a; Gan et al., 2014).

In available PONV prevention consensus guidelines, current and comprehensive evidence on the strategies for the management of PONV were reviewed (Gan et al., 2007; Gan et al., 2014). The current recommendations suggest that interventions should be patient-specific, while also considering patient preference, cost-effectiveness, and level of PONV risk (Gan et al., 2014). Using the Apfel et al. (1999) simplified risk score, a panel of experts considered patients with a score of 0–1 as low risk, a score of 2 as medium risk, and a score of 3 or more as high risk for PONV (Gan et al., 2007; Gan et al., 2014). According to the systemic review of the literature, adults at moderate to high risk for PONV should be administered prophylactic therapy using drugs from different classes (Gan et al., 2007; Gan et al., 2014). In adults at moderate risk for PONV, prophylaxis should include 1 to 2 interventions (Gan et al., 2014). For adults at high risk for PONV, prophylaxis should include 2 or more interventions with the use of multimodal therapy (Gan et al., 2014). Multimodal therapy is the use of a combination of drugs from different classes and with different mechanisms of actions. This approach optimizes the efficacy
of prophylactic PONV prevention, by means of administering a combination of drugs that act on different nausea and vomiting producing receptors (Gan et al., 2014). Some experts recommend giving prophylaxis to all patients, considering the availability of inexpensive generic medications (Gan et al., 2014). However, doing this exposes low risk patients to potential unnecessary adverse effects (Gan et al., 2007; Gan et al., 2014). In summary, current evidence supports that the number of prophylactic interventions should be tailored to patient’s individual risk, while using a multimodal approach for the best outcome (Apfel et al., 2012b; Gan et al., 2007; Gan et al., 2014).

The reduction of baseline risk factors can considerably decrease the occurrence of PONV. Providers can reduce baseline PONV risk by considering the following: use of regional anesthesia when appropriate to avoid using general anesthesia; use a propofol infusion; avoid using nitrous oxide; avoid using volatile anesthetics; minimize the use of perioperative opioids; and provide adequate perioperative hydration (Apfel et al., 2012a; Gan et al., 2014). Previous inclusion of other baseline risk factors, such as the reduction of the dose of an emetogenic muscle relaxant reversal drug (neostigmine) has been disputed by the availability of more recent data, therefore it has been removed from the list of strategies to reduce the baseline risk (Apfel et al., 2012a; Gan et al., 2014).

Several interventions have proved to be effective in reducing PONV. Based on a systemic review of randomized controlled trials (RCTs) by Apfel et al. (2012c), adequate perioperative intravenous fluid hydration with crystalloids was effective in reducing early postoperative nausea (PON) \( (p = 0.003) \), late PON \( (p = 0.004) \), overall PON \( (p = 0.02) \), and overall POV \( (p = 0.004) \). According to Gan et al. (2014), the decision on which type of fluid (crystalloid versus colloid) to use does not have an effect on PONV when comparable volumes
are administered in surgeries with minimal fluid shifts. Apfel et al. (2012c) determined that evidence to suggest greater efficacy with a specific supplemental fluid volume or timing is not available (Apfel et al., 2012c). In a small RCT of 60 female patients undergoing elective open cholecystectomy, perioperative intravenous fluid hydration with the use of crystalloids and colloids reduced the incidence of PONV ($p < 0.001$) (Chaudhary, Sethi, Motiani, & Adatia, 2008). From the results of this RCT, it was concluded that both crystalloids and colloids were found to be equally effective in preventing PONV (Chaudhary, Sethi, Motiani, & Adatia, 2008).

Timely administration of preoperative pharmacological treatment with the use of a transdermal scopolamine (TDS) patch 1.5mg the evening before surgery or two to four hours before the start of anesthesia is most effective (Apfel et al., 2010; Gan et al., 2014; Gan et al., 2009). TDS was associated with a significantly lower incidence of PON ($p < 0.001$), POV ($p < 0.001$), and PONV ($p = 0.001$) during the first 24 hours after the start of anesthesia (Apfel et al., 2010). TDS proved be effective compared with controls in the prevention of PON when initiated the night before ($p < 0.001$) or on the day of surgery ($p < 0.001$) (Apfel et al., 2010). The efficacy of TDS was also proven by Gan et al. (2009) in a RCT which revealed that the combination of TDS and IV ondansetron reduced PONV within the 24-hour period after surgery, compared with the use of ondansetron alone. Total response (meaning no PON, POV/retching, or use of rescue antiemetics) was statistically higher with the combination of TDS and ondansetron, compared to the use of ondansetron only ($p < 0.01$) (Gan et al., 2009). Lastly, the time to the first symptoms of PON, POV/retching, or use of rescue antiemetics was statistically significantly longer with the combination of TDS and ondansetron, compared with the use of ondansetron alone ($P < 0.05$) (Gan et al., 2009).

Methods
Design, Subject, and Setting

The design of this DNP project is a quality improvement project, which entails the development and evaluation of a CPG for PONV prevention. The subjects include a convenience sample of volunteer Certified Nurse Anesthetists (CRNAs) within the anesthesia department of a rural Mid-Atlantic hospital. The project was carried out in three phases, with distinct samples in each of the phases.

Procedures

Phase I of the project began with meetings with the Chief Anesthesiologist and the Chief Nurse Anesthetist. During this meeting, the project proposal was presented in order to gain buy in and permission to move forward with the quality improvement project. Phase II of the project began with identification of an expert panel. The expert panel (n = 2), consisted of staff CRNAs within the anesthesia department. The expert panel, along with three Student Registered Nurse Anesthetists (SRNAs), served as the guideline development group. Following IRB approval, the first meeting with the expert panel was scheduled. In this first meeting, the first draft of the CPG was presented to the expert panel and rated using the Appraisal of Guidelines for Research & Evaluation (AGREE) II tool (AGREE Next Steps Consortium, 2009). AGREE II tool ratings were than discussed and feedback was obtained. Based on feedback from the expert panel and AGREE II tool results, revisions were made to the CPG. During the second meeting with the expert panel, the revised guideline was discussed with the expert panel and final revisions to the guideline were made.

In phase III, the final CPG was presented to the anesthesia providers at anesthesia grand rounds (sample n = 7). The anesthesia providers are the target end users of the CPG guideline, therefore their perception and opinion of the CPG serve as an indication of the probable
endorsement and use of the CPG in clinical practice within this setting. Prior to the start of the presentation, a Practitioner Feedback Questionnaire was distributed to all anesthesia providers in attendance. Following the presentation, providers were asked to fill out the survey anonymously. A secure box with a slit in the top was used collect the surveys to ensure that responses were kept anonymous. Responses from the completed surveys were kept in a secure location. See Appendix B for complete timeline of project.

Data Collection

**AGREE II tool.** The purpose of the AGREE II instrument is to provide a methodological strategy for the development of CPGs, as well as a framework for assessing the quality of CPGs [Brouwers et al., 2010b; National Collaborating Centre for Methods and Tools (NCCMT), 2011]. The AGREE II consists of 23-item questionnaire that is divided in six domains and two global assessment items (see Appendix C) (Brouwers et al., 2010b; NCCMT, 2011). The six domains include: scope and purpose, stakeholder involvement, rigour of development, clarity of presentation, applicability, and editorial independence (Brouwers et al., 2010b; NCCMT, 2011). A quality score is calculated for each of the six AGREE II domains (Brouwers et al., 2010b; NCCMT, 2011). Each of the AGREE II items and one of the global rating item are rated on a seven-point Likert scale (1–strongly disagree to 7–strongly agree), while the second global rating item is in a “yes or no” question format (Brouwers et al., 2010b; NCCMT, 2011).

The validity of the AGREE II items were tested to show the ability of the items to detect differences in guideline quality (Brouwers et al., 2010a). Internal consistency of the six domains ranged from 0.64 to 0.89 (NCCMT, 2011). Two of the domains achieved an alpha value that met accepted standards for internal consistency, which is an alpha value greater than 0.8 (NCCMT, 2011).
**Practitioner feedback questionnaire.** The project outcomes to be measured were anesthesia providers' perceptions of the CPG quality, as well as their endorsement and intention to use the CPG (Brouwers et al., 2004; Brouwers, Hanna, Abdel-Motagally, and Yee, 2009). These outcomes will be measured using the Practitioner Feedback Questionnaire (PFQ), adopted from the Brouwers et al.’s (2004) CAPGO instrument (see Appendix D). The areas to be evaluated include: quality, rigor, acceptability, applicability, and comparative value (Brouwers et al., 2009). Rigor is related to providers' opinions on the rationale of the CPG, quality of scientific methodology used to develop the CPG, and clarity of the recommendations (Brouwers et al., 2009). Acceptability refers to providers' opinions on the aptness of the recommendations, ability of the CPG to yield more benefit than harm, and anticipated acceptance of the recommendations (Brouwers et al., 2009). Applicability refers to providers' perceptions of the feasibility of implementing the recommendations, while considering the technical requirements, organizational requirements, and costs (Brouwers et al., 2009). Comparative value refers to provider’s opinion on how the recommendations compare to current standards of care (Brouwers et al., 2009). Providers’ endorsement of the CPG and their intentions to use the CPG in practice are assessed individually (Brouwers et al., 2009).

The adapted PFQ tool consists of 23 question items, using a five-point Likert scale (strongly disagree, disagree, neither agree or disagree, disagree, strongly agree) (Brouwers et al., 2004). Exceptions to this formatting include the first question, in which providers will be asked to indicate whether the guideline is relevant to their clinical practice (yes, no, unsure) and to indicate provider type (CRNA or Anesthesiologist). If respondents answer “No” or “Unsure” to whether the guideline is relevant to their clinical practice, their questionnaire will not be included in the analysis of the data (Brouwers et al., 2009). There are 20 questions related to the quality,
rigor, acceptability, applicability, and comparative value of the CPG, and two questions related
the extent to which the providers would endorse this CPG, as well as their intention to use the
recommendations in their own clinical practice (Brouwers et al., 2004).

Measures of internal consistency and Cronbach alpha coefficients of the CAPGO
instrument were calculated for each of the factors (Brouwers et al., 2004). The alpha coefficient
for the factors ranged from 0.75-0.85 (Brouwers et al., 2004).

Data Analysis

AGREE II tool. Following the feedback from the expert panel using the AGREE II tool, domain scores were calculated based on the AGREE II tool User’s Manual (NCCMT, 2011). This was done by obtaining a sum all the scores of the individual items in each of the six domains and scaling the total as a percentage of the maximum possible score for each domain (NCCMT, 2011).

Practitioner feedback questionnaire. After collecting data from the PFQ, the data was analyzed using descriptive statistics and inputted into a table format. In reporting the results, the responses “strongly agree” and “agree” were aggregated as “agree,” as well as “strongly disagree” and “disagree” were aggregated as “disagree.” Percentages of each response to the 23 questions and one demographic question was computed.

Protecting Human Rights

Prior to the implementation of the project, submission to the University of Maryland, Baltimore’s IRB for determination of non-human subject research was completed and it was determined that this quality improvement project is non-human research. Written permission was obtained from the Chief Anesthesiologist to proceed with development and evaluation of this CPG. A second IRB process was not needed to carry out this quality improvement project at
this institution. In terms of survey responses, participation in the PFQ was voluntary. Measures to protect human rights of the survey participants include eliminating any participant identifiers. Furthermore, data was collected via a secure box and was stored on a computer with a secure password.

Cultural Assessment

The revised Context Assessment Index (CAI) was utilized in order to assess the likelihood of whether the setting in which this quality improvement project will take place is receptive to change, and to identify what barriers and enablers to change may be present (McCormack, McCarthy, Wright, Slater, & Coffey, 2009). The revised CAI is a 37-item questionnaire developed using the PARIHS framework that assesses the following three elements: culture, leadership, and evaluation, using a four-point Likert scale (McCormack et al., 2009). Adequate internal consistency of the five domains of the original CAI questionnaire was established by calculating measures of homogeneity (McCormack et al., 2009). The Cronbach’s alpha score for the entire questionnaire was 0.93, with the level of internal consistency in scoring of the five factors ranging from 0.78 to 0.91 (McCormack et al., 2009). Reliability of the questionnaire was established using test-retest scores (McCormack et al., 2009). Validity was assessed by using a combination of qualitative and quantitative approaches (McCormack et al., 2009).

Barriers. Barriers often lead to implementation failure if not recognized and appropriately addressed. Using the revised CAI, leadership was one area that was identified as a potential barrier for the implementation of a new practice change in this setting. Leadership received the lowest percentage among all the elements using the revised CAI tool (see Appendix E). In looking at the element leadership, the lack of engagement in clinical supervision as a team
was one identified barrier in this particular setting. (McCormack et al., 2008). Clinical supervision as a team can be accomplished with guideline development as a team effort. Using the collaborative learning framework, Wolf et al. (2016) determined that the use of collaborative learning helps identify and prioritize focused areas for guideline development. Establishing guidelines as a team ensures that the practice recommendations are available and agreed upon. Without a team effort, or input from team members within the anesthesia department, established guidelines may not be used in practice if providers view it as an autocratic decision making process.

One barrier identified within the element of evaluation in this practice setting is the inadequate feedback from patients. The goal of providing anesthesia services is to maintain patient comfort. Without detailed feedback from patients regarding their perioperative experience, like the presence of postoperative nausea, there is no way for providers to determine which modalities are most effective. Organizational factors shown to promote a culture of learning from patients include the following: a strategic vision that is concisely and continuously communicated to all staff; involvement of patients and families; and patient experience feedback and reporting (Schlesinger, Grob, & Shaller, 2015). Information collected from patients can be used to induce changes in clinical practice through private reporting in an effort to change professional norms and for peer review (Schlesinger et al., 2015). This creates a pathway towards incentives that encourage a supportive and receptive culture (Schlesinger et al., 2015).

**Enablers.** In examining the scores obtained from the revised CAI, there were key enablers identified that would prove to be useful in implementing the CPG in this setting. Within the element of culture, the team of anesthesia providers were identified as being receptive to change. The providers are open to adjusting their practice, if evidence-based research is
available to support the change and if the change would improve care. This type of culture assists with leveraging change in the clinical setting. According to Gerrish and Clayton (2004), health care organizations should use multiple strategies to facilitate evidence-based change in practice. In an attempt to implement change, key factors including managerial support, facilitation, and a culture that is receptive to change are necessary (Gerrish & Clayton, 2004). Therefore, armed with the necessary evidence-based information, it will subsequently increase the likelihood that providers will be more receptive to change, and therefore more likely to accept an evidenced-based CPG.

The next important enabler identified under the element of culture is the ability to define the culture in terms of the prevailing values and beliefs. In this particular setting, the anesthesia providers are patient-centered. One of the important elements of a quality improvement program is to consider the organizational culture, beliefs, and values when attempting to implement change (Grant, 2011). In 2011, Grant developed a quality improvement and patient safety program. One of the enablers of the project was the values and beliefs of the doctors (Grant, 2011). Due to their long hours, job complexity, and emotional commitment, it was believed that they developed a strong core value, which focused on providing the best care for the patient (Grant, 2011). This was one of the important enablers during the implementation of the program (Grant, 2011). When taking this into consideration during the implementation of the CPG, the established belief that patients come before the team will increase the likelihood that change will take place.

Results and Discussion

Results

**AGREE II tool.** From the Agree II tool scoring of the CPG by the expert panel, the
domain Scope and Purpose received 94%, Stakeholder Involvement received 58%, Rigour of Development received 91%, Clarity of Presentation received 100%, Applicability received 87%, and Editorial Independence received 96%. In terms of the global rating, the overall assessment of the quality of the CPG was given a rating of 6 out of 7 by both members of the expert panel. Also, both members of the expert panel indicated that they would recommend the CPG for use in clinical practice (see Appendix F for results).

**Practitioner feedback questionnaire.** A total of seven providers responded to the PFQ. All seven of the providers were CRNAs (see Appendix G for results). From the results of the PFQ, in terms of the area of quality, 100% of the respondents agreed that the CPG recommendations and the rationale for developing the CPG were clear. Also, 100% of the respondents agreed with the methodology used to summarize the evidence, and that the results were interpreted per their understanding. Eighty-six percent agreed that there is a need for a guideline on this topic, whereas 14% neither agreed or disagreed. Eighty-six percent agreed that the literature search was relevant and complete, whereas 14% neither agreed or disagreed.

In terms of acceptability, 100% of the respondents agreed that the CPG recommendations were suitable as stated for the intended patient population. Furthermore, 100% of the respondents disagreed that the CPG recommendations are too expensive to apply. Fifty-seven percent disagreed that the CPG recommendations are too rigid to apply to individual patients, whereas 14% neither agreed or disagreed, and 29% agreed. Eighty-six percent agreed that when applied, the CPG recommendations will produce more benefits for patients than harm, whereas 14% neither agreed or disagreed. Eighty-six percent agreed that the CPG presents options that will be acceptable to patients, whereas 14% neither agreed or disagreed. Sixty-seven percent of the respondents agreed that the draft guideline recommendations are likely to be supported by a
majority their colleagues, where 33% neither agreed or disagreed. Eighty-three percent of the respondents disagreed that the CPG recommendations will be technically challenging, whereas 17% neither agreed or disagreed. Thirty-three of the respondents disagreed that the application of the CPG will require reorganization of services/care in their practice setting, where 67% neither agreed or disagreed. Fifty percent of the respondents agreed that if they follow the draft guideline recommendations, the expected effects on patient outcomes will be obvious, whereas 50% neither agreed or disagreed.

In terms of comparative value, 33% of the respondents agreed that if applied, the CPG recommendations will result in better use of resources than current practice, whereas 50% neither agreed or disagreed, and 17% replied not applicable. Fifty percent of the respondents agreed that the CPG recommendations reflect a more effective approach for improving patient outcomes than usual practice, whereas 33% neither agreed or disagreed, and 17% replied not applicable.

In the area of endorsement, 100% of the respondents agreed that they would feel comfortable if their patient received the care recommended in the CPG. Eighty-three of the respondents agreed that the CPG should be approved as a practice guideline, whereas 17% neither agreed or disagreed.

Lastly, in terms of intention to use the CPG, 100% of the respondents agreed that if this CPG were to be approved as a practice guideline, they would apply the recommendations to their patients. Eighty-three of the respondents agreed that if this CPG were to be approved as a practice guideline, they would use it in their own practice, whereas 17% neither agreed or disagreed.

**Discussion**

As mentioned, in the results from the expert panel’s AGREE II scores of the initial CPG,
the domain Stakeholder Involvement received the lowest score. The expert panel indicated that the CPG development group did not include individuals from all relevant professional groups. To improve upon this in the future, a multidisciplinary expert panel can be consulted which includes other disciplines, such as pharmacy and nursing. The expert panel also indicated that the views and preferences of the target population were not sought. This is a result of the quality improvement project being non-human research, therefore patients were not used as subjects. As a result, the views and preferences of the patients were not obtained.

Due to the limited number of providers present at anesthesia rounds when the CPG was presented, there was a 30% response rate to the Practitioner Feedback Survey amongst CRNA providers. Although this response rate was lower than intended, it provides a snapshot of providers’ opinion of the CPG. This can be used to make further revisions to the guideline prior to future dissemination and use in the clinical setting. Reassuring feedback was given in the areas of the PFQ that measured quality, acceptability, endorsement, and intention to use the CPG. In terms of comparative value, feedback from providers suggest that one barrier to future implementation of the CPG in clinical practice may be providers not perceiving using the CPG as better than current practice.

Extension of this quality improvement project in the future would include dissemination and use of the CPG in the clinical setting. This could then be followed up with further data collection in the form of quality reports and chart reviews of the anesthesia record. Data to be collected would include providers’ adherence with the CPG and use of appropriate PONV prophylaxis. Long term outcomes to be measured include the incidence of PONV and a net profit/loss analysis for the hospital.

Summary
Considering the untoward effects, the prevention and management of PONV following outpatient surgery continues to be an important task. After performing an assessment of the culture within the anesthesia department at this specific institution, a strategy was deployed to facilitate the development and evaluation of a CPG for PONV prevention and management. This was accomplished with input from end users within the department. Despite lower than intended response rate to the PFQ, the overall responses obtained indicate that anesthesia providers would endorse and use the recommendations in their clinical practice. With ongoing efforts in this quality improvement project, the ultimate goal would be to increase prophylactic treatment of PONV in patients at risk, and subsequently decrease the incidence of PONV.
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### Appendix A

#### Literature Review: The Johns Hopkins Nursing Evidence-based Practice Rating Scale

<table>
<thead>
<tr>
<th>Study #</th>
<th>Author and Date</th>
<th>Study Design</th>
<th>Sample Size</th>
<th>Findings</th>
<th>Limitations</th>
<th>Evidence Rating</th>
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| 1       | Apfel, Läärä, Koivuranta, Greim, & Roewer, 1999 | An analysis was conducted from prospectively collected data in order to investigate whether risk scores are valid across centers and whether risk scores can be simplified without loss of discriminating power | Adult patients from two centers (Oulu, Finland: $n = 520$, and Wuerzburg, Germany: $n = 2,202$) | Simplification did not weaken the discriminating power (area under the curve $= 0.63-0.73$). Final simplified risk score: female gender ($p < 0.0001$), history of motion sickness or PONV ($p = 0.0003$), nonsmoking ($p < 0.0001$), and the use of postoperative opioids ($p = 0.0002$). | - Study published more than 10 years ago  
- Threat to internal validity: no randomization  
- Threat to external validity: study only considered data from two centers | II A |
| 2       | Apfel, Heidrich, Jukar-Rao, Jalota, Hornuss, Whelan, & ... Cakmakkaya, 2012a | A systematic review and meta-analysis of prospective studies in order to investigate which risk factors are independent predictors of PONV. | A total of 22 studies were used ($N = 95,154$) | Strongest patient-related predictors: female gender, history of PONV/motion sickness, non-smoking status, history of motion sickness, and age ($p < 0.001$). Strongest anesthesia-related predictors: volatile anesthetics, duration of anesthesia, use postoperative opioids ($p < 0.001$), and nitrous | - Threat to internal validity: no randomization  
- Was not stated whether prospective studies used were RCTs | I A |
<table>
<thead>
<tr>
<th></th>
<th>Study Authors and Year</th>
<th>Study Design</th>
<th>Number of RCTs</th>
<th>Key Findings</th>
<th>Methodological Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Apfel, Zhang, George, Shi, Jalota, Hornuss, &amp; ... Kranke, 2010</td>
<td>A systematic review and meta-analysis comparing the effects of transdermal scopolamine (TDS) and placebo on postoperative nausea, vomiting, and PONV</td>
<td>25 RCTs were analyzed ($N=3,298$)</td>
<td>TDS was also associated with a significantly lower incidence of PON ($p&lt;0.001$), POV ($p&lt;0.001$), and PONV ($p=0.001$) during the first 24 hours after surgery. TDS proved be effective compared with controls in the prevention of PON when initiated the night before (early application) ($p&lt;0.001$) or on the day of surgery (late application) ($p&lt;0.001$).</td>
<td>Analysis did not show a statistically significant effect of TDS during the 24- to 48-hour period</td>
</tr>
<tr>
<td>4</td>
<td>Apfel, Meyer, Orhan-Sungur, Jalota, Whelan, &amp; Jukar-Rao, 2012c</td>
<td>Systemic review of RCTs that compared the effects of supplemental I.V. crystalloids with a conservative fluid regimen for the prevention of PONV</td>
<td>15 RCTs ($n=787$ crystalloids; $n=783$ conservative fluids)</td>
<td>I.V. Crystalloids reduced the incidence of early PON ($p=0.003$), late PON ($p=0.004$), and overall PON ($p=0.02$). I.V. crystalloids did not reduce the risk of early POV ($p=0.16$) or late POV ($p=0.09$), but did reduce overall POV ($p=0.004$). I.V. crystalloids did not</td>
<td>About half of the studies included in the review had sample sizes of &lt;50 patients per treatment group</td>
</tr>
</tbody>
</table>
reduce the incidence of early PONV ($p=0.16$), but did reduce the incidence of late PONV ($p<0.001$) and overall PONV ($p=0.003$). I.V. crystalloids reduced the need for antiemetic rescue treatment ($p<0.001$).

|   | Chaudhary, Sethi, Motiani, Adatia, 2008 | Prospective randomized clinical trial, where patients were randomly allocated into three equal groups. Group A patients received 2 ml/kg Lactated Ringer’s (LR) (control), Group B patients received 12 ml/kg of LR and Group C patients received 12 ml/kg of 4.5% Hetastarch | $n=60$ | Using a visual analogue scale (VAS) for the rating of nausea/vomiting, mean VAS scores in Groups B and C were less than that of Group A patients throughout post-op period, with significant difference 4 hours post-op ($p<0.001$). The VAS scores of Groups B and C patients were comparable throughout. Crystalloids and colloids were found to be equally effective in preventing PONV. | - All patients received preoperative fluid supplementation | I | B |
|---|---|---|---|---|---|---|
| 5 | Gan, Diemunsch, Habib, Kovac, Kranke, Meyer, & ... Tramèr, 2014 | Consensus guideline of the literature by a multidisciplinary international panel of experts on PONV in order to | Consensus guideline of 335 publications | 1) Female gender was the strongest patient-specific predictor, followed by a history of PONV, nonsmoking status, history of motion sickness, and age. 2) The | - Not all of the publications were from RCTs, some observational studies and case reports were | IV | B |
construct an evidence-based reference tool for the management of PONV

| 7 | Gan, Sinha, Kovac, Jones, Cohen, Battikha, & ... Glass, 2009 | Randomized, double blind, multicenter trial comparing the effects of the combination of transdermal scopolamine (TDS) and IV ondasentron (OND) with using IV OND alone | $n=618$ | The combination of TDS and OND reduced PONV/retching compared with OND alone in the 24-hour period after surgery, but not at 48 hours. 48% of the patients in the TDS and OND group and to 39% of the patients in the OND alone group did not experience PONV/retching and did not use rescue antiemetics ($p<0.02$). Total response (no PON, POV/retching or rescue antiemetics) was also included
| Study did not include different age populations. Patients were not restricted to a specific surgical procedure | I | A |
| | | | statistically higher for the TDS + OND group compared with the OND-only group ($p<0.01$). The time to first PON, POV/retching, or the use of rescue antiemetics was longer for the TDS + OND group compared with the OND-only group ($p<0.05$). | | |
Appendix B
Timeline of DNP Project

<table>
<thead>
<tr>
<th>Completion Date</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 2016</td>
<td>• Identified expert panel</td>
</tr>
</tbody>
</table>
| May 2016        | • Submitted proposal to committee members  
|                 | • Presented project proposal to DNP committee for approval |
| July 2016       | • Submitted project proposal to UMB’s Institutional Review Board (IRB) |
| July 2016       | • Meeting with Chief Anesthesiologist and the Chief Nurse Anesthetist to submit project proposal and obtain permission to move forward with the quality improvement project |
| September 2016  | • First meeting with expert panel to present CPG and AGREE II tool |
| October 2016    | • Second meeting with expert panel to present revised guidelines |
| January 2017    | • Presented CPG to anesthesia providers at anesthesia rounds  
|                 | • Distributed Practitioner Feedback Questionnaire following meeting |
| February 2017   | • Analyzed, synthesized, and evaluated data from Practitioner Feedback Questionnaire |
| February 2017   | • Submitted final scholarly project manuscript to committee for review |
| March 2017      | • Presentation of final scholarly project report to Committee |
Appendix C
AGREE II Tool

Appraisal of Guidelines for Research & Evaluation II

DOMAIN 1. SCOPE AND PURPOSE

1. The overall objective(s) of the guideline is (are) specifically described.

<table>
<thead>
<tr>
<th>1 Strongly Disagree</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7 Strongly Agree</th>
</tr>
</thead>
</table>

Comments

2. The health question(s) covered by the guideline is (are) specifically described

<table>
<thead>
<tr>
<th>1 Strongly Disagree</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7 Strongly Agree</th>
</tr>
</thead>
</table>

Comments

3. The population (patients, public, etc.) to whom the guideline is meant to apply is specifically described.

<table>
<thead>
<tr>
<th>1 Strongly Disagree</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7 Strongly Agree</th>
</tr>
</thead>
</table>

Comments

DOMAIN 2. STAKEHOLDER INVOLVEMENT

4. The guideline development group includes individuals from all relevant professional groups
5. The views and preferences of the target population (patient, public, etc.) have been sought.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7 Strongly Agree</th>
</tr>
</thead>
</table>

Comments

6. The target users of the guideline are clearly identified.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7 Strongly Agree</th>
</tr>
</thead>
</table>

Comments

**DOMAIN 3. RIGOUR OF DEVELOPMENT**

7. Systematic methods were used to search for evidence.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7 Strongly Agree</th>
</tr>
</thead>
</table>

Comments
8. The criteria for selecting the evidence are clearly described.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
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<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strongly Disagree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

Comments

9. The strengths and limitations of the body of evidence are clearly described.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
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<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strongly Disagree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

Comments

10. The methods for formulating the recommendations are clearly described.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
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<th>5</th>
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<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strongly Disagree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

Comments

11. The health benefits, side effects, and risk have been considered in formulating the recommendations.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
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<th>6</th>
<th>7</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Strongly Disagree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

Comments
12. There is an explicit link between the recommendations and the supporting evidence.

<table>
<thead>
<tr>
<th>1 Strongly Disagree</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7 Strongly Agree</th>
</tr>
</thead>
</table>

Comments

13. The guideline has been externally reviewed by experts prior to its publication.

<table>
<thead>
<tr>
<th>1 Strongly Disagree</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7 Strongly Agree</th>
</tr>
</thead>
</table>

Comments

14. A procedure for updating the guideline is provided.

<table>
<thead>
<tr>
<th>1 Strongly Disagree</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7 Strongly Agree</th>
</tr>
</thead>
</table>

Comments

DOMAIN 4. CLARITY OF PRESENTATION

15. The recommendations are specific and unambiguous.

<table>
<thead>
<tr>
<th>1 Strongly Disagree</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7 Strongly Agree</th>
</tr>
</thead>
</table>

Comments
16. The different options for management of the condition or health issue are clearly presented.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
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<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

Comments

17. Key recommendations are easily identifiable.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
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<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

Comments

DOMAIN 5. APPLICABILITY

18. The guideline describes facilitators and barriers to application.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

Comments

19. The guideline provides advice and/or tools on how the recommendation can be put into practice.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

Comments
20. The potential resource implications of applying the recommendations have been considered.

<table>
<thead>
<tr>
<th>1 (Strongly Agree)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7 (Strongly Disagree)</th>
</tr>
</thead>
</table>

Comments

21. The guideline presents monitoring and/or auditing criteria.

<table>
<thead>
<tr>
<th>1 (Strongly Agree)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7 (Strongly Disagree)</th>
</tr>
</thead>
</table>

Comments

**DOMAIN 6. EDITORIAL INDEPENDENCE**

22. The views of the funding body have not influenced the content of the guideline.

<table>
<thead>
<tr>
<th>1 (Strongly Agree)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7 (Strongly Disagree)</th>
</tr>
</thead>
</table>

Comments

23. Competing interests of guideline development group members have been recorded and addressed.

<table>
<thead>
<tr>
<th>1 (Strongly Agree)</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7 (Strongly Disagree)</th>
</tr>
</thead>
</table>

Comments
OVERALL GUIDELINE ASSESSMENT

1. Rate the overall quality of this guideline.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

Comments

2. I would recommend this guideline for use

Agree II Tool

Appraisal of Guidelines for Research & Evaluation II

DOMAIN 1. SCOPE AND PURPOSE

1. The overall objective(s) of the guideline is (are) specifically described.
2. The health question(s) covered by the guideline is (are) specifically described
3. The population (patients, public, etc.) to whom the guideline is meant to apply is specifically described.

DOMAIN 2. STAKEHOLDER INVOLVEMENT

4. The guideline development group includes individuals from all relevant professional groups
5. The views and preferences of the target population (patient, public, etc.) have been sought.
6. The target users of the guideline are clearly identified.

DOMAIN 3. RIGOUR OF DEVELOPMENT

7. Systematic methods were used to search for evidence.
8. The criteria for selecting the evidence are clearly described.
9. The strengths and limitations of the body of evidence are clearly described.
10. The methods for formulating the recommendations are clearly described.
11. The health benefits, side effects, and risk have been considered in formulating the recommendations.
12. There is an explicit link between the recommendations and the supporting evidence.
13. The guideline has been externally reviewed by experts prior to its publication
14. A procedure for updating the guideline is provided.

DOMAIN 4. CLARITY OF PRESENTATION

15. The recommendations are specific and unambiguous.
16. The different options for management of the condition or health issue are clearly presented.
17. Key recommendations are easily identifiable.
DOMAIN 5. APPLICABILITY
18. The guideline describes facilitators and barriers to application
19. The guideline provides advice and/or tools on how the recommendation can be put into practice.
20. The potential resource implications of applying the recommendations have been considered
21. The guideline presents monitoring and/or auditing criteria

DOMAIN 6. EDITORIAL INDEPENDENCE
22. The views of the funding body have not influenced the content of the guideline.
23. Competing interests of guideline development group members have been recorded and addressed

OVERALL GUIDELINE ASSESSMENT
1. Rate the overall quality of this guideline.
2. I would recommend this guideline for use.

Appendix D
Practitioner Feedback Questionnaire

Demographics: are you a CRNA □, MDA □
For each item, please check off the box that most adequately reflects your opinion.

<table>
<thead>
<tr>
<th>1. Are you responsible for the care of patients for whom this draft guideline report is relevant? This may include the referral, diagnosis, treatment, or follow-up of patients.</th>
<th>Yes □</th>
<th>No □</th>
<th>Unsue □</th>
</tr>
</thead>
<tbody>
<tr>
<td>If you answered &quot;No&quot; or &quot;Unsure&quot;, there is no need to answer or return this questionnaire. If you answered &quot;Yes&quot;, please answer the questions below and return to secure survey box</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<p>| 2. The rationale for developing a guideline is clear. | Strongly agree □ | Agree □ | Neither agree or disagree □ | Disagree □ | Strongly disagree □ |
| 3. There is a need for a guideline on this topic. | □ | □ | □ | □ | □ |
| 4. The literature search is relevant and complete (e.g., no key evidence was missed nor any included that should not have been) in this draft guideline. | □ | □ | □ | □ | □ |
| 5. I agree with the methodology used to summarize the evidence included in this draft guideline. | □ | □ | □ | □ | □ |
| 6. The results of the evidence described in this draft guideline are interpreted according to my understanding of the evidence. | □ | □ | □ | □ | □ |
| 7. The draft recommendations in this report are clear. | □ | □ | □ | □ | □ |
| 8. I agree with the draft recommendations as stated. | □ | □ | □ | □ | □ |
| 9. The draft recommendations are suitable for the patients for whom they are intended. | □ | □ | □ | □ | □ |
| 10. The draft recommendations are too rigid to apply to individual patients. | □ | □ | □ | □ | □ |
| 11. When applied, the draft recommendations will produce more benefits for patients than harms. | □ | □ | □ | □ | □ |
| 12. The draft guideline presents options that will be acceptable to patients. | □ | □ | □ | □ | □ |
| 13. To apply the draft recommendations will require reorganization of services/care in my practice setting. | □ | □ | □ | □ | □ |
| 14. To apply the draft guideline recommendations will be technically challenging. | □ | □ | □ | □ | □ |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neither agree or disagree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.</td>
<td>The draft guideline recommendations are too expensive to apply.</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>16.</td>
<td>The draft guideline recommendations are likely to be supported by a majority of my colleagues.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>If I follow the draft guideline recommendations, the expected effects on patient outcomes will be obvious.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>The draft guideline recommendations reflect a more effective approach for improving patient outcomes than is current usual practice. (If they are the same as current practice, please tick NA). NA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>When applied, the draft guideline recommendations will result in better use of resources than current usual practice. (If they are the same as current practice, please tick NA). NA</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>20.</td>
<td>I would feel comfortable if my patients received the care recommended in the draft guideline.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>21.</td>
<td>This draft guideline should be approved as a practice guideline.</td>
<td></td>
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</tr>
<tr>
<td>22.</td>
<td>If this draft guideline were to be approved as a practice guideline, I would use it in my own practice.</td>
<td></td>
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</tr>
<tr>
<td>23.</td>
<td>If this draft guideline were to be approved as a practice guideline, I would apply the recommendations to my patients.</td>
<td></td>
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</tr>
</tbody>
</table>

Appendix E

The Context Assessment Index (CAI)

For each of the following statements, please put a cross in one box only. A – Strongly agree; A – Agree; D – Disagree; SD – Strongly disagree

HCP= Healthcare professionals

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Personal and professional boundaries between HCPs are maintained</td>
<td>SA</td>
<td>A</td>
<td>D</td>
</tr>
<tr>
<td>2</td>
<td>Decisions on care and management are clearly documented by all staff</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>A proactive approach to care is taken</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>All aspects of care/treatment are based on evidence of best practice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>The nurse leader acts as a role model of good practice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>HCPs provide opportunities for patients to participate in decisions about their own care</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Education is a priority</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>There are good working relations between clinical and non-clinical staff</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Staff receive feedback on the outcomes of complaints</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>HCPs in the MDT have equal authority in decision making</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Audit and/or research findings are used to develop practice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A staff performance review process is in place which enables reflection on practice, goal setting and is regularly reviewed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Staff have explicit understanding of their own attitudes and beliefs towards the provision of care</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Patients are encouraged to be active participants in their own care

There is high regard for patients privacy and dignity

HCPs and healthcare support workers understand each others role

The management structure is democratic and inclusive

Appropriate information (large written print, tapes, etc) is accessible to patients

HCPs and patients work as partners providing individual patient care

Care is based on comprehensive assessment

Challenges to practice are supported and encouraged by nurse leaders and nurse managers

Discussions are planned between HCPs and patients

The development of staff expertise is viewed as a priority by nurse leaders

Staff use reflective processes (e.g. action learning, clinical supervision or reflective diaries) to evaluate and develop practice

Organisational management has high regard for staff autonomy

Staff welcome and accept cultural diversity

Evidenced-based knowledge on care is available to staff

Patients have choice in assessing, planning and evaluating their care and treatment

HCPs have the opportunity to consult with specialists

HCPs feel empowered to develop practice

Clinical nurse leaders create an environment conducive to the development and sharing of ideas

Guidelines and protocols based on evidence of best practice (patient experience, clinical experience, research) are available
32 Patients are encouraged to participate in feedback on care, culture and systems
33 Resources are available to provide evidence-based care
34 The organisation is non-hierarchical
35 HCPs share common goals and objectives about patient care
36 Structured programmes of education are available to all HCPs


Table A1

**Scores from the Context Assessment Index**

### Element: Culture

<table>
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<td>2</td>
<td>2</td>
<td>3</td>
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Appendix F

AGREE II Tool Scoring

**DOMAIN 1. SCOPE AND PURPOSE**

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**DOMAIN 1. SCORE = 94%**

**DOMAIN 2. STAKEHOLDER INVOLVEMENT**

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**DOMAIN 2. SCORE = 58%**

**DOMAIN 3. RIGOUR OF DEVELOPMENT**

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**DOMAIN 3. SCORE = 91%**

**DOMAIN 4. CLARITY OF PRESENTATION**

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<th>Item 17</th>
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</tr>
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**DOMAIN 4. SCORE = 100%**
### Domain 5. Applicability

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<td>7</td>
</tr>
<tr>
<td>CRNA 2</td>
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**Domain 5. Score = 87%**

### Domain 6. Editorial Independence

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<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>14</td>
<td>13</td>
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</table>

**Domain 6. Score = 96%**

### Overall Guideline Assessment

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<thead>
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<th>Recommend for Use</th>
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<tbody>
<tr>
<td>CRNA 1</td>
<td>6</td>
</tr>
<tr>
<td>CRNA 2</td>
<td>6</td>
</tr>
</tbody>
</table>
Appendix G

Responses to Practitioner Feedback Questionnaire

<table>
<thead>
<tr>
<th>Questions</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics: are you a CRNA or MDA?</td>
<td>100%</td>
</tr>
<tr>
<td>1. Are you responsible for the care of patients for whom this draft guideline report is relevant? This may include the referral, diagnosis, treatment, or follow-up of patients.</td>
<td>100%</td>
</tr>
<tr>
<td>2. The rationale for developing a guideline is clear.</td>
<td>100%</td>
</tr>
<tr>
<td>3. There is a need for a guideline on this topic.</td>
<td>86% 14%</td>
</tr>
<tr>
<td>4. The literature search is relevant and complete (e.g., no key evidence was missed nor any included that should not have been) in this draft guideline.</td>
<td>86% 14%</td>
</tr>
<tr>
<td>5. I agree with the methodology used to summarize the evidence included in this draft guideline.</td>
<td>100%</td>
</tr>
<tr>
<td>6. The results of the evidence described in this draft guideline are interpreted according to my understanding of the evidence.</td>
<td>100%</td>
</tr>
<tr>
<td>7. The draft recommendations in this report are clear.</td>
<td>100%</td>
</tr>
<tr>
<td>8. I agree with the draft recommendations as stated.</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Agree or Agree</td>
</tr>
<tr>
<td>---</td>
<td>----------------</td>
</tr>
<tr>
<td>9.</td>
<td>The draft recommendations are suitable for the patients for whom they are intended.</td>
</tr>
<tr>
<td>10.</td>
<td>The draft recommendations are too rigid to apply to individual patients.</td>
</tr>
<tr>
<td>11.</td>
<td>When applied, the draft recommendations will produce more benefits for patients than harms.</td>
</tr>
<tr>
<td>12.</td>
<td>The draft guideline presents options that will be acceptable to patients.</td>
</tr>
<tr>
<td>13.</td>
<td>To apply the draft recommendations will require reorganization of services/care in my practice setting.</td>
</tr>
<tr>
<td>14.</td>
<td>To apply the draft guideline recommendations will be technically challenging.</td>
</tr>
<tr>
<td>15.</td>
<td>The draft guideline recommendations are too expensive to apply.</td>
</tr>
<tr>
<td>16.</td>
<td>The draft guideline recommendations are likely to be supported by a majority of my colleagues.</td>
</tr>
<tr>
<td>17.</td>
<td>If I follow the draft guideline recommendations, the expected effects on patient outcomes will be obvious.</td>
</tr>
<tr>
<td>18.</td>
<td>The draft guideline recommendations reflect a more effective approach for improving patient outcomes than is current usual practice.</td>
</tr>
<tr>
<td>19.</td>
<td>When applied, the draft guideline recommendations will result in better use of resources than current usual practice</td>
</tr>
<tr>
<td></td>
<td>Agree</td>
</tr>
<tr>
<td>---</td>
<td>-------</td>
</tr>
<tr>
<td>20. I would feel comfortable if my patients received the care recommended in the draft guideline.</td>
<td>100%</td>
</tr>
<tr>
<td>21. This draft guideline should be approved as a practice guideline.</td>
<td>83%</td>
</tr>
<tr>
<td>22. If this draft guideline were to be approved as a practice guideline, I would use it in my own practice.</td>
<td>83%</td>
</tr>
<tr>
<td>23. If this draft guideline were to be approved as a practice guideline, I would apply the recommendations to my patients.</td>
<td>100%</td>
</tr>
</tbody>
</table>
Appendix H
Clinical Practice Guideline

General

Guideline Title
Clinical Practice Guideline for Postoperative Nausea and Vomiting Prevention During Outpatient Surgery

Scope

Disease/Condition(s)
Outpatient surgical patients at risk for postoperative nausea and vomiting

Guideline Category
Screening
Management
Prevention
Treatment

Clinical Specialty
Anesthesiology
Preoperative care

Intended Users
Certified Nurse Anesthetists (CRNAs)
Anesthesiologist

Guideline Objective(s)
The objective of this clinical practice guideline (CPG) is to optimize the prevention of postoperative nausea and vomiting (PONV) in adults undergoing outpatient surgery.
Note: For the purpose of this guideline, optimal postoperative nausea and vomiting prevention is defined as no vomiting, no retching, no nausea, and no use of antiemetic agents within the first 24-hour period following surgery.

Target Population
The target populations to whom this guideline will apply are adults undergoing outpatient surgery and are at risk of developing postoperative nausea and vomiting (PONV).
Interventions and Practices Considered

1. Preoperative risk assessment
2. Multimodal drug therapy
3. Minimizing baseline risk
4. Rescue anti-emetics postoperatively

Major Outcomes Considered

- Prevalence of and risk factors for postoperative nausea and vomiting (PONV)

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Identification and Appraisal of Existing Guidelines: A guideline was sought which could be adapted at a Mid-Atlantic community hospital for the management of postoperative nausea and vomiting (PONV). Based on the consensus from the evidence, a CPG was developed by CPG development team for interpretation and possible application by end users.

a. Guideline Search Strategy: During February and March 2016, the PONV Guideline Development Group conducted a search of bibliographic databases to identify existing practice guidelines for the management of PONV in adults undergoing outpatient surgery. Computerized searches were performed using the EBSCOhost platform for CINAHL, PubMed and MEDLINE databases.

b. Guideline Selection Criteria and Appraisal: Guidelines were selected for inclusion that: (i) provided recommendations for the prevention of PONV; (ii) were published in 2007 or more recently; and (iii) were published in English. Guidelines were excluded if it was not clear that the guideline recommendations were based on a review of evidence from the literature and/or were not based on a source that used evidence to support the guideline development process.
Methods Used to Analyze the Evidence
Systematic Review with development of evidence tables

Methods Used to Formulate the Recommendations
Consensus by CPG development group and expert panel

Description of Methods Used to Formulate the Recommendations

Health Questions. The guideline sought to answer the following health questions:

1. What approaches are recommended to prevent the development postoperative nausea and vomiting (PONV) in adults?
2. What interventions are available to minimize the baseline risk of developing PONV?
3. What interventions are recommended to control PONV in patients who develop it?

Recommendations

Major Recommendations

Note: Quality and strength of the evidence is defined in the “Methods Used to Assess the Quality and Strength of the Evidence” field.

Health Question#1: What approaches are recommended to prevent the development postoperative nausea and vomiting (PONV) in adults?

Preoperative Prevention Recommendations

- A comprehensive assessment of the patient’s medical history and review of available anesthesia records should be completed (Evidence IA) (Apfel, et al., 2012a).
- Four independent predictors of PONV, which include female gender, history of motion sickness or PONV, nonsmoking status, and the use of postoperative opioids, should be used to identify patients’ simplified risk score (Evidence IA) (Apfel et al., 1999; Apfel, et al., 2012a)
  - Remarks: In addition to the four predictors of PONV, age <50 years may be considered as a potential risk factor for PONV, as well as the type of surgery, including cholecystectomy, gynecological surgery, and laparoscopic surgery. The strongest anesthesia related contributors to PONV are the use of volatile
anesthetics, duration of anesthesia, use of postoperative opioids, and nitrous oxide (Evidence IA) (Apfel, et al., 2012a)

- Determine the risk classification based on the number of risk factors for PONV using the simplified risk score from Apfel, et al., 2012 (shown in Table 1 below):
  - Low-risk: score of 0-1
  - Medium-risk: score of 2-3

- Adequate intravenous perioperative fluid hydration was effective to reduce PONV
  - Remarks: The decision on which type of fluid (crystalloid versus colloid) to use does not have an effect on PONV when comparable volumes that are administered in surgeries with minimal fluid shifts (Gan et al., 2014). Furthermore, evidence to suggest greater efficacy with a specific supplemental fluid volume or timing is not available (Evidence IA) (Apfel, et al., 2012).

- Timely administration of preoperative pharmacological treatment with the use of transdermal scopolamine patch 1.5mg the evening before surgery or 2 to 4 hours before the start of anesthesia (Evidence IA) (Apfel, et al., 2010).

Table 1

PONV Simplified Risk Score

<table>
<thead>
<tr>
<th>Risk Factors</th>
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<td>1</td>
</tr>
<tr>
<td>Non Smoker</td>
<td>1</td>
</tr>
<tr>
<td>Female Gender</td>
<td>1</td>
</tr>
<tr>
<td>History of PONV/Motion Sickness</td>
<td>1</td>
</tr>
<tr>
<td><strong>Risk score</strong></td>
<td><strong>0 ... 4</strong></td>
</tr>
</tbody>
</table>

*Note. Adapted from Apfel, et al., 2012*

Intraoperative Prevention Recommendations

- Using the Apfel et al. (1999) simple risk score, patients with a score of 0–1 are considered low risk, a score of 2 as medium risk, and a score of 3 or more as high risk for PONV.

- Adults at moderate to high risk for PONV should be administered prophylactic therapy using drugs from different classes (Evidence Level IA) (Nesek-Adam, et al., 2007).
In adults at moderate risk for PONV, prophylaxis should include 1 to 2 interventions (Gan, et al. 2014).

For adults at high risk for PONV, prophylaxis should include 2 or more interventions with the use of multimodal therapy. (Gan, et al. 2014).

Multimodal therapy is the use of a combination of drugs from different classes and mechanisms of actions (Evidence Level IB) (Nesek-Adam, et al., 2007).

A propofol infusion should be instituted in high-risk patients as an alternative to anesthetic inhalational agents (Evidence Level IB) (Joe, et al., 2016).

Health Question #2: What interventions are available to minimize the baseline risk of developing PONV?

The following strategies should be considered in an effort to reduce PONV baseline risk:

- adequate hydration (Evidence IA) (Apfel, et al., 2012b)
- minimize the use of perioperative opioids (Evidence IA) (Apfel, et al., 2012a)
- minimize the use of nitrous oxide and volatile anesthetics (Evidence IA) (Apfel, et al., 2012a; Joe, et al., 2016; Leslie, et al., 2008).
- use of propofol for induction and maintenance (Evidence Level IB) (Joe, et al. 2016)
- regional anesthesia instead of general anesthesia (Evidence Level IVB)( Gan, et al. 2014)
Figure 2

Postoperative Nausea and Vomiting Reduction Strategies

**PONV REDUCTION STRATEGIES**

- **Reduction of Baseline Risk**
  - 1. regional anesthesia instead of general anesthesia
  - 2. adequate hydration
  - 3. use of propofol for induction and maintenance
  - 4. minimize the use of perioperative opioids
  - 5. minimize the use of nitrous oxide and volatile anesthetics

**Low-risk:** score of 0
- No anti-emetic needed
  - Example: ± Ondansetron 4 mg

**Low-risk:** score of 1
- 1 anti-emetic may be administered (not necessary)
  - Example: Ondansetron 4 mg or Dexamethasone 4 mg

**Medium-risk:** score of 2-3
- 1-2 anti-emetics
  - Example: Ondansetron 4 mg + Dexamethasone 4 mg ± Propofol infusion

**High-risk:** score > 3
- >2 anti-emetics + TIVA with propofol drip
  - Example: Ondansetron 4 mg + Dexamethasone 4 mg + Propofol infusion ± Scopolamine patch

Health Question #3: What interventions are recommended to control PONV in patients who develop it?

**Postoperative Management Recommendations**

- When rescue therapy is required, the antiemetic should be chosen from a different therapeutic class than the drugs used for prophylaxis, and potentially one with a different mode of administration. If PONV occurs within 6 hours postoperatively, patients should not receive a repeat dose of the prophylactic antiemetic (Evidence IVB) (Gan, et al., 2014). Drugs to consider:
POSTOPERATIVE NAUSEA AND VOMITING PREVENTION

- Phenergan 12.5-25mg IV or IM (Evidence IIB) (Habib, et al., 2007)
- An emetic episode more than 6 hours postoperatively can be treated with any of the drugs used for prophylaxis except dexamethasone and transdermal Scopolamine (Evidence IVB) (Gan, et al. 2014).
  - Ondansetron 4mg IV and 8mg orally disintegrating tablets
  - Most of the available research on the 5-HT3 receptor antagonists involves ondansetron, which has greater anti-vomiting than anti-nausea effects. Ondansetron is the “gold standard” compared with other anti-emetics (Evidence IA) (Grover et al., 2009)
- The decrease in opioid consumption post-operatively using non-opioid analgesic adjuncts has been demonstrated to decrease the incidence of opioid-related nausea and vomiting (Evidence IA) (Martinez, et al., 2017). Consider the following non-opioid analgesics:
  - Non-steroidal anti-inflammatory drugs (NSAIDs)
  - Acetaminophen

Systematic Reviews of Primary Studies

a. **Prevention and Treatment of PONV**: a systematic review of primary studies evaluating identification and screening of PONV risk factors

i. **Search Strategy**: The following databases were searched and included articles indexed as of March 30, 2016: CINAHL, PubMed, and MEDLINE databases.

ii. **Selection Criteria and Appraisal**: Three reviewers independently screened citations for relevance. All citations identified as potentially relevant by either reviewer were included for full-text screening. Three reviewers independently evaluated the full-text papers to determine whether they met the inclusion criteria. Primary studies were included if they: (i) were published in a journal in full text; (ii) were published in English; (iii) evaluated an intervention for the prevention or treatment of PONV; (iv) reported the proportion of patients experiencing PONV and (v) the number of participants was >1,000 per study.

**Number of Source Documents**
Identification and Appraisal of Existing Guidelines: 2 PONV prevention guidelines that were developed for use in adults met the inclusion criteria and were assessed. None of the guidelines were selected for adaptation.

Systematic Reviews of Primary Studies: Interventions to prevention and/or treatment of postoperative nausea and vomiting (PONV): 9 studies met the inclusion criteria

Methods Used to Assess the Quality and Strength of the Evidence

The following is adapted from the Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) Rating Scale and was utilized to assess the strength of the evidence (Newhouse, Dearholt, Poe, Pugh, & White, 2007).

Strength of Evidence:

- **Level I:** Experimental study/RCT or meta-analysis of RCT
- **Level II:** Quasi-experimental study
- **Level III:** Non-experimental study, qualitative study, or meta-synthesis.
- **Level IV:** Opinion of nationally recognized experts based on research evidence or expert consensus panel (systematic review, clinical practice guidelines)
- **Level V:** Opinion of individual expert based on non-research evidence. (Includes case studies; literature review; organizational experience e.g., quality improvement and financial data; clinical expertise, or personal experience)

Quality of Evidence:

- **A** - High quality: consistent results, sufficient sample size, adequate control, and definitive conclusions; consistent recommendations based on extensive literature review that includes thoughtful reference to scientific evidence.
- **B** - Good quality: reasonably consistent results, sufficient sample size, some control, and fairly definitive conclusions; reasonably consistent recommendations based on fairly comprehensive literature review that includes some reference to scientific evidence
- **C** - Low quality or major flaws: little evidence with inconsistent results, insufficient sample size, and conclusions cannot be drawn.

Guideline Development Panel
POSTOPERATIVE NAUSEA AND VOMITING PREVENTION

The PONV Guideline Development Panel was formed in December of 2015.

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

External Peer Review

Internal Peer Review

Description of Method of Guideline Validation

External Review and Consultation Process:

Who Was Asked to Review the Guideline?

Content Expert Review

Practicing CRNAs within the anesthesia department will be asked to review the draft guideline.

External Stakeholder Review

Anesthesia providers working at the Mid-Atlantic community hospital will be asked to review the draft guideline and complete a Practitioner Feedback Questionnaire.

What Process Was Followed?

The clinical practice guideline CPG will be developed in collaboration with an expert panel consisting of two Certified Registered Nurse Anesthetists (CRNAs). A draft of the CPG, derived from graded evidence to support the guideline, will be presented to the expert panel. The expert panel will assess the quality of the CPG using the AGREE II tool. Revisions to the CPG will be made accordingly based on feedback from the expert panel. During a follow up meeting with the expert panel, the revised guideline will be presented to the expert panel. Following this meeting, the final revised copy of the clinical practice guideline will be submitted to the Chief Anesthesiologist, and feedback on the CPG will be obtained. The final CPG will be distributed and presented to the clinical anesthesia staff at anesthesia grand rounds.

Discussion of Feedback
A Practitioner Feedback Questionnaire will be distributed to all anesthesia providers in attendance at anesthesia grand rounds when the CPG is presented. Following the presentation, providers were asked to fill out the survey anonymously. Recommendations from providers will be discussed with the expert panel, and the guideline will be revised accordingly.

**Benefits/Harms of Implementing the Guideline Recommendations**

**Potential Benefits**
Improved perioperative care and reduced risk of PONV in high-risk patients undergoing outpatient surgery.

**Potential Harms**
None identified

**Facilitators**
No extra cost incurred to patient or staff

**Barriers**
Staff adaptation of recommended practice

**Qualifying Statements**
This clinical practice guideline developed by graduate doctoral nurse anesthesia students using evidence-based or best practice addresses “postoperative nausea and vomiting prevention during outpatient surgery” with references available at the time of its creation. Care has been taken to ensure accuracy of the information provided. However, every anesthesia provider using this guideline is responsible for providing care according to their best professional judgment and the policies and standards of the anesthesia department. Once this guideline is adopted, update and revisions should be conducted every 2 years based on available current evidence.

**Implementation of the Guideline**

**Description of Implementation Strategy**

**Guideline Implementation Considerations.** Evidence-based guidelines should be used to select antiemetic interventions to prevent and treat PONV. The patient’s risk factors should be used as a guide to select the appropriate antiemetic modalities to prevent PONV. The anesthesia department should evaluate the evidence-based guidelines for endorsement or adaptation.
Identifying Information

Guideline Committee
Dr. Veronica Amos, CRNA, PhD and Dr. Nicholas Oscanyon, CRNA, DNP

Guideline Expert Panel
Leann Greise, CRNA and Verna Roman, CRNA

Composition of Group That Developed the Guideline
Guideline development panel: Aneesah Shaheed, Elisabeth Abraham, Grace Akinrolabu

Institution
A Level II trauma community hospital

Geographical location
Mid-Atlantic region

Financial Disclosures/Conflicts of Interest
The guideline development panel has no conflicts of interest or financial disclosure with respect to the development of this guideline.

Bibliographic Sources


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