Educating Anesthesia Providers to Implement Postoperative Nausea and Vomiting Risk Assessment as a Standard of Care

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Abstract

Introduction/Purpose

The prevention of postoperative nausea and vomiting (PONV) is a challenging task that must be addressed both to decrease patient dissatisfaction and postsurgical complications. PONV is a distressing and costly side effect of general anesthesia, leading to a prolonged post anesthesia care unit (PACU) stay and unplanned hospital admissions. The causes of PONV are multifactorial and can largely be categorized as patient risk factors, anesthetic technique, and surgical procedure. In high risk individuals, the incidence of PONV can be as high as 80%. Therefore, effective strategies in identifying risk factors and providing prophylaxis to patients can lead to higher patient satisfaction and better utilization of healthcare dollars. An extensive body of research exists on the causes, prediction, prevention, and treatment of PONV, which has resulted in the development of risk scores, guidelines, and evidence-based treatment protocols. Unfortunately, limited knowledge of the guidelines and low adherence to them are a well-known problem. The omission of properly identifying patients' risk factors during the preoperative interview allows for inadequate coverage of PONV. The purpose of this evidence-based practice (EBP) change project was to use educational interventions to assist anesthesia providers with identifying PONV risk factors utilizing the Apfel assessment tool.

Methods

A quantitative project utilizing a pretest and posttest design consisting of a twenty item True/False questionnaire, designed to measure the knowledge base of anesthesia providers on PONV, was administered. An educational intervention about the prevention and treatment of PONV using evidence-based guidelines was provided to the anesthesia providers after the initial

survey. A posttest was re-administered six weeks post intervention to assess retention of knowledge.

Results

A paired t-test was used to compare pre and posttest results related to knowledge gained from the educational intervention. The paired t test (Pre-M = 16.78, SD = 1.64/Post-M = 18.33, SD = 1.22) looked at pre and post intervention scores per participant. The results indicated that per participant ($t = 8.85$, $p = 0.0001$) a statistically significant improvement in knowledge was found between the pre and post intervention scores.

Discussion

The hope was that educating providers by presenting a simplified yet accurate method of assessing patients for PONV, the provider would gain useful knowledge regarding patients' risk, integrate prophylactic therapies, and help decrease unnecessary expenditure of financial resources due to unplanned and prolonged admissions. The evidence from this project supports that the educational offering did have a statistically significant effect on each participant's knowledge, and retention of PONV best practices when using a pre/posttest design.

Key words: Postoperative nausea and vomiting, PONV risk, PONV risk assessment tool, Apfel risk assessment, PONV prevention, PONV education, ambulatory surgery, general anesthesia, knowledge.

Educating Anesthesia Providers to Implement Postoperative Nausea and Vomiting Risk Assessment as a Standard of Care

Introduction

Postoperative nausea and vomiting (PONV) are a daily concern for patients and anesthesia providers, is uncomfortable for patients, can prolong hospitalization, and can often lead to more serious complications. This conundrum of PONV poses a threat to overall patient safety and well-being postoperatively. Each occurrence predisposes patients to life threatening co-morbidities including dehydration, electrolyte imbalance, suture tension, dehiscence, venous hypertension, bleeding, esophageal rupture, airway compromise, and the overall decrease in postoperative quality of life (Comprendio et al., 2017). PONV can strain institutional resources and manpower by prolonging post-anesthesia care unit (PACU) stay to an average of 25 additional minutes with the total financial impact extending beyond added hospitalization, delayed recovery and loss of productivity (Comprendio et al., 2017).

PONV is experienced by approximately one third of all surgical patients. Identification of patients at risk for PONV through preoperative risk assessment is an effective means in reducing the incidence of PONV (Smith & Ruth-saud, 2016). Anesthesia providers are positioned to implement such risk assessments by utilizing simplified risk scores to identify moderate to high-risk patients. Accurately identifying patients at risk for PONV can help anesthesia providers decide which recommended prophylactic antiemetics to administer which positively impacts the patients' surgical outcome and experience. Targeted prophylaxis is efficacious in reducing the institutional incidence of PONV which decreases resource utilization and cost (Smith & Ruth-saud, 2016). Anesthesia providers are the crucial component in minimizing the PONV in the post-surgical patient. Evaluation of the evidence reveals that

preoperative PONV risk screening leads to decreased incidence of PONV for the surgical patient, improves patient satisfaction and reduces postoperative complications (Smith & Ruth-saud, 2016).

Background

PONV is an adverse reaction and physiologic response to the surgical process represented by the expression of queasiness, unsettled stomach, and urge to retch or vomit (nausea) and/or the frank expulsion of gastric contents (vomiting) occurring within 24 hours of surgery (Smith & Ruth-saud, 2016). The phases of PONV have been defined as either the early or late phase. The early phase is defined as PONV occurring within 2 hours of the end of surgery, and the late phase (a combination of late and delayed) is defined as PONV occurring between 2 and 24 hours (and beyond) from the end of surgery (Gan et al., 2014). Since most surgical procedures are performed on an outpatient basis, the late phase of PONV is usually categorized as post discharge nausea and vomiting in this population and may lead to readmission (Smith & Ruth-saud, 2016).

Knowledge of PONV risk factors is crucial for the optimal use of antiemetic prophylaxis and multimodal management strategies. Identification of independent risk factors associated with PONV has enabled the development of risk assessment and risk-scoring tools used to predict the potential occurrence of PONV in adults (Hooper, 2015). Several studies have indicated the value of using a risk assessment tool for patient comfort and cost effectiveness for all parties involved. Identification of these factors during the preoperative period can be used to establish a prophylactic management plan for PONV (Spruce & White, 2015). Therefore, incorporating a risk assessment tool within the clinical setting will be of excellent value for the patient, provider, and institution.

There is a documented incidence of approximately 0.2% of patients that experience PONV, leading to a delayed discharge and creating disruption to the surgical flow of operation (Chatterjee et al., 2011). According to Gabriel et al. (2014), greater than two hours recovery in the PACU is considered a prolonged stay. Values from the 2006 National Survey of Ambulatory Surgeries (NSAS) suggest that the average length for a PACU stay in a free-standing surgical center is an average of 97.7 minutes and 146.6 minutes in a hospital base surgical center. A delayed discharge is defined as a patient leaving the PACU greater than thirty minutes after the decision that discharge is medically appropriate (Gabriel et al., 2017). Early intervention for PONV should decrease incidences leading to more effective post anesthesia throughput and a more satisfied patient.

Problem Statement

The continued prevalence of PONV in patients undergoing general anesthesia with volatile agents has prompted the development of multi-disciplinary, evidence-based guidelines. Increasing provider knowledge will help identify and address ways to prevent PONV which will allow for more cost-effective utilization of available resources. PONV significantly increases healthcare cost and specifically PACU cost by delaying patients' discharge both directly and indirectly. The direct costs include both the cost of medications and additional direct patient care (Hooper, 2015). Indirectly cost increases are secondary to hospital readmission resulting in potential loss of income for patients (Hooper, 2015).

Organizational "Gap" Analysis of Project Site

Current observations of the US Anesthesia Partners (USAP) anesthesia group indicates that anesthesia providers initiate the effort of preventing PONV but by providing repeat doses of a specific antiemetic. The duplication of the antiemetic drug could create a variety of problems

including cardiac dysrhythmias, gastrointestinal disturbances, and urinary complications; all increasing the length of stay and associated acquired cost (Tinsley & Barone, 2013). Many of these complications can be avoided with proper prevention measures. Therefore, the clinical problem guiding this EBP change project is the lack of awareness and knowledge among providers on risk factors and additional methods of prevention for PONV prevention.

Review of the Literature

Several guidelines on the management of PONV have been published. A systematic review of the literature concerning PONV management in adult and pediatric patients undergoing surgery was conducted according to the protocol recommended by the Cochrane Collaboration. The search was divided into six areas: algorithms, prophylaxis, treatment effectiveness, nonpharmacological or alternative therapy, risk assessment, and risk reduction. Current recommended guidelines include: **Guideline 1: It would be important to establish a method to identify patients at risk for PONV.** A patient's baseline risk for PONV should be objectively assessed using a validated risk score that is based on independent predictors. Each surgical patient would be given a PONV risk assessment pre-operatively and scored accordingly. The use of PONV risk scores for patients undergoing balanced inhaled anesthesia are the Koivuranta score and the Apfel score (Gan et al., 2014). The use of PONV risk scores has been demonstrated to significantly reduce the institutional rate of PONV. **Guideline 2: Reduce baseline risk factors for PONV.** Reducing baseline risk factors can significantly decrease the incidence of PONV. Strategies recommended to reduce baseline risk include: 1. The avoidance of general anesthesia by the use of regional anesthesia; 2. Preferential use of propofol infusions; 3. Avoidance of nitrous oxide; 4. Avoidance of volatile anesthetics; 5. Minimization of perioperative opioids; and 6. Adequate hydration. **Guideline 3: Administer PONV prophylaxis**

using 1 to 2 interventions in adults at moderate risk for PONV (Gan et al., 2014). Clinically approved drugs that are new or require further studies since the last guidelines are 5HT3 receptor antagonists, NK-1 receptor antagonists, corticosteroid, butyrophenone, and antihistamine (Gan et al., 2014). Ondansetron has been found to be effective in preventing and treating PONV after general anesthesia, and its safety profile is good with the recommended doses of 4 mg and 8 mg. Ondansetron is said to have a significant antiemetic effect on patients suffering from opioid-induced emesis. Combination therapy for PONV prophylaxis is preferable to using a single drug alone. Apfel demonstrated that the effects of antiemetics acting on different receptors are additive. Therefore, patients at moderate risk for PONV should receive combination therapy with drugs from different classes as the efficacy is optimized when a combination of drugs with different mechanisms of action are administered (Gan et al., 2014).

There have been several instruments created to help identify patients at risk for PONV so that they may be properly addressed and adequately treated. Estimating an individual's risk for PONV can indicate who will most likely benefit from prophylactic therapies. The current guidelines were developed under the support of the Society of Ambulatory Anesthesia (SAMBA) (Gan, et al., 2014). Those guidelines include identifying the patients at risk, reducing baseline risk factors for PONV, administering PONV prophylaxis, ensuring PONV prevention and treatment is implemented in the clinical setting, and using multimodal prevention to implement PONV policies (Hooper, 2015). According to Odom-Forren (2011), patient demographic characteristic such as female gender, non-smoking, history of PONV, type of surgery, and postoperative opioids are the most important and prevalent predictors for PONV, elevating the risk from 70% to upwards of 80%. Another significant factor includes the use of nitrous oxide or volatile gases for anesthesia. Based on the risk factors, algorithms have been developed for

assessing the degree of PONV to plan preventative treatment for patients. Introducing a simple risk assessment tool, such as the Apfel simplified risk assessment, helps identify patients at risk for PONV. The simplified Apfel risk score classified the patients as having none, one, two, three, or four risk factors present, the incidences of PONV were 10%, 21%, 39%, 61%, 79% respectively (Apfel et al., 2002). Tools like the Apfel can help guide the provider to a more intuitive individualized care plan with multimodal preventative treatments and interventions (refer to Appendix A). Estimating the incidence of PONV as a function of baseline risk, based on the assumption that each intervention reduces the relative risk by twenty six percent should become a standard of care (Odom-Forren, 2011). Reliable and valid instruments are essential to the study of reduction of PONV and its treatments.

Sherif et al (2015) performed an observational study with 150 low surgical risk adult participants to validate the use of a risk assessment score that identifies high risk patients for PONV. The aim of the study was to validate the risk assessment score in identifying at risk patients for PONV. Sherif et al (2015) focused on healthy adult patients undergoing general endotracheal (GETA) classified by the American Society of Anesthesiologist (ASA) as ASA I or ASA II. The study excluded patients scheduled for laparoscopic, neurosurgical, cardiothoracic, strabismus surgeries and patients that took prophylactic anti emetics. The study revealed the incidence of PONV using the Apfel risk score 0, I, II, III, IV was 8,3%, 25.5%, 37.8%, 64.6% and 83.3% respectively with the predicted incidence of 10%, 21%, 39%, 61%, and 79% (Sherif et al., 2015). The total incidence of PONV among all patients within a twenty-four-hour period was 42%. According to Sherif et al., (2015), the result of the observational study provided information that lead to providing prophylactic anti emetics preoperatively and intraoperatively versus omitting prophylactic therapies due to the low surgical risk. The study revealed with the

use of a risk assessment tool in addition to therapeutic pharmacological therapy the overall incidence of PONV will be decreased. The limitations of this study were the small sample size. The results of the aforementioned study were comparable to the Wielbach study, that follows and predicted the incidence of PONV in high surgical risk patients using a risk assessment score.

A retrospective, cross sectional study was performed by Myklejord et al. (2012), to examine the efficacy of PONV risk assessment management guidelines on the institutional level. The focus was to align as much as possible with the 2003 SAMBA consensus guidelines. In a six-month period (January-July 2005) 300 adult surgical patients, greater than eighteen years old, were interviewed for risk, monitored for PONV occurrences, and prophylactically treated throughout the perioperative period. During the initial period, the current guidelines were not adopted institution wide, in order preempt any potential learning bias by individuals (Myklejord et al., 2012). However, in 2007, after the guidelines were adopted, another six-month period (September 2007 – May 2008) and an additional 301 adult surgical patients who received general anesthesia were included in the study. Obese patients and patients who underwent surgical interventions for preexisting nausea and vomiting conditions were excluded from the study – i.e.: gastrointestinal obstruction, endoscopies, and colonoscopies. A comparison was made in the conventional risk factors for PONV and treatment between the pre guideline and post guidelines. Results were compared using a 2-tailed t-test. The comparison revealed pre guideline to post guideline implementation of a preoperative risk assessment and prophylactic treatment were 10.7% vs. 31/6% of patients were treated, 15.3% vs 36.9% were treated with multimodal therapies prophylactically based on two or more risk factors, and 31.3% vs 24.3% of patients were not treated (Myklejord et al., 2012). Implementation of a PONV risk assessment tool following the SAMBA guidelines significantly reduced the rate of PONV from 8.36% to 3.01%,

p = 0.0047 (Myklejord et al., 2012). The patients identified from the risk assessment tool with two or more risk factors was significantly associated with PONV. As demonstrated by this study, implementing a PONV risk assessment and preemptive therapeutic therapies can reduce the incidence of PONV.

Evidence-Based Practice (EBP): Verification of Chosen Option

To help facilitate a safe, consistent, and cost-effective care, EBP should be the standard of care in all healthcare facilities. However, according to White and Spruce (2015), many providers make clinical decisions using other sources rather than EBP, such as previous experiences for example. For providers to operate from an evidence-based perspective, they need to be aware of how to introduce, develop, and evaluate EBP.

While implementing practice change via evidence-based methods may be challenging for some anesthesia providers to accept, studies indicate that these practices ultimately lead to exceptional outcomes, decreases in healthcare cost, and increases in patient satisfaction (Melnyk & Fineout-Overholt, 2015). To adequately guide an EBP change project, an answerable question must be formulated. A well-developed question can be formatted using the PICO concept (P-population of interest, I-intervention/issue of interest, C-comparison of interest, O-outcome expected) (Melnyk & Fineout-Overholt, 2015). The question creates the foundation which will assist in determining whether the evidence is relevant to the topic. For example: *In anesthesia providers that provide anesthesia for same day surgery patients (P), does implementing a preoperative PONV risk assessment tool to guide prophylactic treatment (I) compared to using a variable routine without a guiding assessment tool (C) improve provider knowledge of PONV (O)?*

Theoretical Framework or Evidence Based Practice Model

Antiemetic administration for the USAP anesthesia group at Methodist Charlton Medical Center is provider preference with or without regards to the many factors that may contribute to PONV. Therefore, the non-standardized practice consists of either under treating; leading to moderate to severe PONV, or over treating; potentially causing untoward events. The goal of this EBP change project was to educate providers on PONV and introduce a risk assessment model to predict patients' risk for PONV providing evidence-based recommendations of how to appropriately prevent, treat, or manage PONV. Dr. Katherine Kolcaba's Change Theory (2010) has been identified as an influential template to help promote change. When used during the implementation of a PONV risk assessment, the providers gain a better understanding thus creating a more accepting and empathetic learning environment for practice change.

Dr. Kolcaba, a mid-range theorist, developed a conceptual framework for patient comfort to help improve patient satisfaction and outcomes. Kolcaba first introduced her Theory of Comfort in 1994 which was based on "my work as a graduate student studying the concept of comfort" (McEwen & Willis, 2011, p. 234). Kolcaba's theory consists of the education, research, and the intentional assessment of comfort needs. According to Kolcaba (2010), the comfort theory was structured to enable more efficient, satisfying, and goal directed practice to meet the present-day challenges of obtaining and maintaining patients' comfort. Her theory explains patient comfort exists in three forms: relief, ease, and transcendence. According to Kolcaba, comfort is obtained when relief is experienced from an undesirable outcome such as PONV, the feeling of contentment when ease is being experienced, and the belief of being able to rise above any challenge is considered transcendence (Kolcaba, 2010). Dr. Kolcaba's theory of comfort

supports the practice change of increasing provider knowledge with the implementation of a risk assessment model for PONV, creating desirable and comforting outcomes post anesthesia.

Kolcaba's comfort theory is an appropriate approach that assists in performing innovative interventions to help provide comfort to post anesthesia patients. Patient comfort is viewed as a standard of care and valued by many providers, making Kolcaba's comfort theory relevant to perioperative care, in particular PONV. For example, the current methods of achieving PONV comfort focus on relieving patients' perceived discomfort, leading to a state of ease and transcendence (Kolcaba, 2010). While the comfort theory is easy to both comprehend and implement, it challenges providers to prioritize patient comfort by identifying and individualizing PONV risk and treatments, as well as help improve institutional integrity, creating a practice change. Prevention of PONV is a skilled balance of both the art and science of anesthesia, additionally it is a sought-after approach to help alleviate postsurgical discomfort and complications. According to Kolcaba (2010), the four contexts in which patient comfort can occur are physical, psycho-spiritual, environmental, and sociocultural. By managing patients' comfort will mitigate the patients' anxiety of having surgery or any preventive procedures that includes general anesthesia. The comfort theory presents a framework to educate providers on how to incorporate EBP to help identify PONV risk preoperatively, with a PONV risk assessment model, which can significantly enhance patient comfort postoperatively. As the provider engages with the patient to prepare them for surgery, having an active conversation regarding PONV prevention will not only comfort the patients' psycho-spiritual by eliminating distress, but also create physical comfort postsurgical procedure. Taking heed of each response can create a comforting environment that has a holistic outcome for each patient. Therefore,

providers being well educated and utilizing a PONV risk assessment model, not only help identify high risk patients, but also compliments Kolcaba's theory of comfort (Kolcaba, 2010).

Goals, Objectives, and Expected Outcomes

The administration of antiemetics are often based on provider preference rather than EBP. The lack of usage of a PONV risk assessment model is one of several culprits contributing to the non-standardization of prophylactic therapy (Hooper, 2015). Over time many providers utilize a "one treatment fits all" type of prophylactic treatment. This unintentional action identifies a deficit in anesthesia providers' knowledge and subsequently their practice. This deficit is the result of the lack of continuous education of EBP studies and tools that have been evaluated to decrease the unpleasant symptoms (Hooper, 2015). The purpose of this EBP project is to increase anesthesia providers' knowledge by utilizing a standardized tool to assist in identifying patients' PONV risk and individualizing care plans accordingly. Identifying risk will allow providers to expand therapeutic treatment plans and rediscover other methodologies of PONV prevention and treatment.

PONV guidelines have been compiled by individuals of the Society for Ambulatory Anesthesia (SAMBA) (Nathan, 2020). The guidelines were created to provide an evidence-based reference for the management of patients with noted increased risk of PONV (Nathan, 2020). Identification and prevention of PONV will therefore decrease uncomfortable postoperative circumstances such as delayed discharges, that hinder the flow of post anesthesia care, and potentially avoid unexpected hospitalizations (Nathan, 2020). A PONV risk assessment model will be presented to anesthesia providers. Providers will be surveyed both pre and post educational intervention regarding PONV risk factors and prophylactic interventions. This EBP project of a PONV risk assessment model implementation will not only create a forward motion

of providers consistently practicing patient risk tailored preventative care, but also make providers aware of a variety of available resources for PONV prophylaxis. This in turn will potentially contribute to increased patient satisfaction, increased provider knowledge, and decreased unexpected PONV complications (Nathan, 2020). Outcomes measuring will be important in assessing the success and effectiveness of the project. The measured outcome will be increased anesthesia provider knowledge. This increase in knowledge will be accomplished by presenting educational handouts, materials and an informative lecture on PONV. The increase in knowledge will be measured by comparing results of the pre and post educational assessment questionnaires consisting of general knowledge, pathophysiological factors, pharmacological therapies, and individual care plans. Providers are expected to improve their scores on the post-test.

Methods

Project Design

This project implemented the use of the Apfel risk assessment scale and recommendations for prevention of PONV through an educational intervention for the anesthesia providers of the group (Sherif et al., 2015). Providing information by way of presentation and handouts of the etiology of PONV, along with its risk factors, increases anesthesia providers' knowledge. Providers develop a greater sense of awareness of PONV as a problem and they have available resources and a PONV guideline of recommendations available for prevention (Sherif et al., 2015). Implementation of a risk assessment protocol and identifying patients at a higher risk of PONV reduce the incidence of PONV encountered post-surgery. Decreasing the undesirable incidence of PONV improves patient satisfaction by preventing adverse surgical

problems and limiting PACU length of stay; both avoiding preventable hospital admission and untoward health cost (Odom-Forren, 2011).

Project Site and Population

This EBP project took place in the U.S. Anesthesia Partners (USAP) anesthesia group, Methodist South West (MSW) Division which provides inpatient and outpatient anesthesia services at the Methodist Charlton Medical Center (MCMC). MCMC is a public Level II Trauma and Certified Stroke institution that has a large population of medically indigent patients. Implementation of this EBP occurred within the anesthesia department which covers the operating room (OR), cardiac cath lab, interventional radiology department, gastrointestinal (GI) lab, and the Emergency Department (ED). The USAP MSW Division anesthesia group currently performs 9000 anesthetics yearly. This 13-member anesthesia group consists of 7 Medical Doctors (MDs), 3 OB CRNAs (Obstetrical Certified Registered Nurse Anesthetists) and 3 OR CRNAs (Operating Room Certified Registered Nurse Anesthetists). For the purpose of this EBP, a total of 9 anesthesia providers (7 MDs and 2 OR CRNAs) were trained to utilize the perioperative risk assessment. Anesthesia providers that were members of the U.S. Anesthesia Partners (USAP) anesthesia group, Methodist Southwest Division, providing anesthesia services, to both inpatients and outpatients, at the Charlton Methodist Medical Center in Dallas, Texas were included. Anesthesia providers (MD or CRNA) employed by the group on an as needed (PRN) basis were excluded.

Measurement Instruments and Data Collection

In order to successfully implement the preventative guidelines and decrease the incidence of PONV, proper organization of meetings, materials, and resources must be planned and readily available (Sherif et al., 2015). Prior to initializing the project, anesthesia providers were

presented with a brief letter and consent script describing the project, a pre-assessment on PONV prevention, and a one-page handout to be used as a future reference guide (See Appendix A). The pre-intervention assessment scores were recorded and coded for matching to post-intervention assessment scores. Completion of the pre-assessment was understood as inferred consent to participate. The educational content regarding the project was presented during the monthly anesthesia meeting in the conference room utilizing the projector and large screen to present the project and anticipated outcomes. Each participant was provided with a hard copy of the presentation as well as received an electronic copy. Six weeks was allowed for full implementation of the guidelines after the educational intervention. After six weeks, a post-intervention assessment was administered to the same anesthesia providers. Nine copies were needed for the initial presentation which included all operating room anesthesia providers (7 MDs and 2 CRNAs). Other printed materials such as the Apfel risk assessment scale and PONV prophylactic recommendations (based on suggestions per the literature review) were copied and laminated (refer to Appendix A). The questionnaire was given in paper and pencil format with 30 minutes allotted for each participant to complete. Each provider was assigned a unique identifier number on their pre and post intervention assessments for matching purposes. The key to the identifier numbers was kept in a secure file on UA Box. The anesthesia providers pre assessment and post assessment scores were computed, recorded and compared accordingly. All electronic data was stored in the secure UA Box. Hard copies of the assessment were kept in a locked drawer that could only be accessed by the primary investigator. Microsoft word and power point were used for written material and oral presentations. The project took a total of 8 weeks for completion due to varying schedules secondary to vacations.

Data Analysis

The evaluation tool utilized to assess the increased level of knowledge and understanding of PONV in the pre and post assessment is Jolley's Survey of Adaptation (See Appendix B). This survey was composed by Sue Jolley to obtain a baseline of nurses' knowledge regarding PONV and the treatment thereof. The questionnaire-based study demonstrated knowledge gaps with only sixty percent of providers giving correct responses (Rahman & Beattie, 2008). The questionnaire consists of twenty true/false statements that covers topics such as the general knowledge of PONV, antiemetic drugs and their side effects, and provider knowledge (Jolley, 2000). Although Jolley's Survey of Adaptation has not undergone formal validation testing, it has been used in studies by Jolley and Lewthwaite to determine knowledge deficits regarding PONV (Jolley, 2000 & Lewthwaite, 2008). Permission for use of this survey was obtained from RCI Publishing. Proper understanding of PONV assists in creating an individualized prevention plan. With this prevention plan comes the implication that the patients will have decreased PONV resulting in lower surgical complications, prevention of operational disruptions, delayed discharges in the PACU, and ultimately an increase in patient satisfaction.

Results

Participants consisted of seven male anesthesiologists (MDs) and two female CRNAs all employed by the USAP MSW Division Anesthesia Group totaling nine active participants. Participants ranged from age 35-60 years and were primarily English speaking. The years of anesthesia training/practice ranged from 5-30 years. An internal benchmark of a passing score was 80%, based on the common passing score used by the institution for continuing education assessments. An external benchmark of a 10% pre/post assessment increase was established in the literature review (Tinsley & Barone, 2013). As such, both the external and internal

benchmarks were successfully met, in that the mean pretest score was 83.8% and the mean posttest was 94% resulting in all participants achieving greater than 80% and an overall increase more than 10% in the participant's knowledge (Tinsley & Barone, 2013). Participants were encouraged to not research any of the answers associated with the pretest/posttest but to utilize the PowerPoint and materials provided to clarify any information. A paired t-test (See Appendix C) was used to compare overall pre and posttest results related to knowledge gained from the educational intervention. The paired t-test (Pre-M = 16.78, SD = 1.64/Post-M = 18.33, SD = 1.22) looked at pre and post intervention scores per participant. The results indicated that per participant ($t = 8.85$, $p = 0.0001$) a statistically significant improvement in knowledge was found between the pre and post intervention scores. All participants demonstrated an improved score in their pre and post intervention scores.

Interpretation/Discussion

Projects are vehicles for creating, managing, and implementing change. Educating anesthesia providers on PONV assessment and prevention increases their knowledge base and subsequently, increases use of a PONV assessment tool and treatment protocol. The outcome of knowledge gained for this project was measured by comparing the Jolley assessment pretest and posttest scores. The tests were graded and compared utilizing the participants assigned number. The same twenty item T/F questionnaire was administered for both the pretest and posttest with a six-week difference between the two. Despite administering the same test for pre and post education, the six-week time difference between the two helped prevent simple memory of both the test and its answers. Results showed that there was an increase in provider knowledge as shown by the increase in scores that met the predetermined benchmark. Therefore, the overall

increase in scores supports the literature that provider education of a PONV risk assessment decreases the overall incidence of PONV.

Cost-Benefit Analysis/Budget

The budget for this project included negligible printing costs and time allotted during the staff meeting. However, the potential cost benefit could be considered great when a decrease in PONV is considered. Especially given the deleterious impact of PONV on a patient's experience as well as the increased cost (i.e.., prolonged PACU stay, unexpected hospital admission, additional medications, etc.) of care associated with this complication (Hooper, 2015).

Timeline

After IRB approval was obtained, project implementation followed an eight-week timeline. Initially providers were given the educational training and survey during an all provider's meeting. The next six weeks were allowed for guideline implementation. For two weeks after implementation, providers were resurveyed for knowledge of PONV. Evaluation of the project and dissemination of the work followed for two more months culminating with the completion of this manuscript.

Ethical Considerations/Protection of Human Subjects

There are minimal risks associated with this project related to the potential for confidentiality breach for participants. Institutional Review Board (IRB) approval was obtained prior to initiation of project implementation. Any hard data like the surveys were kept in a locked drawer where only the PI had access. Any electronic data was stored securely on UA Box. Unique identifiers were assigned to each provider for survey matching purposes and all data was deidentified. The key to the unique identifiers was stored securely on UA Box.

Conclusion

PONV continues to be a highly undesirable outcome of general anesthesia with volatile gases. PONV is experienced by approximately one third of all ambulatory surgical patients and is a great concern for those who receive general anesthesia for their scheduled outpatient procedure (Smith & Ruth-saud, 2016). A need to address clinical practice variations, knowledge deficit, and available preventative resources among anesthesia providers related to PONV was identified. This EBP change project was designed to increase provider knowledge which in turn reduces the incidence of PONV, thereby increasing patient satisfaction and reducing delayed discharges. The primary goal for early recognition of high-risk PONV patients is to prevent the symptom rather than treating the problem. It is fundamental to significantly improving provider knowledge, outcomes, and patient satisfaction (Smith & Ruth-saud, 2016). Post implementation of the educational component, the overall incidence of education increased among anesthesia providers as evidenced by a significant increase of the posttest scores.

The absence of PONV is considered to be a significant indicator of quality anesthesia and high-quality patient care. Anesthesia providers have a vital role in facilitating early postoperative recovery by creating an environment of preventative measures (Nathan, 2020). Anesthesia providers can optimize the patient's surgical experience, promote patient safety and decrease the potential associated cost of PONV (Odom-Forren, 2011). Literature revealed that PONV risk rarely was assessed and prophylaxis was not tailored to the patient (Odom-Forren, 2011). The repetitive action of untailored patient PONV preventative care was attributed to the lack of education. The purpose of the implementation of this EBP project was to effect change by focusing on increasing provider knowledge and ultimately improve postoperative outcomes. Training providers to combat PONV by using a more standardized approach addresses the

recommendations published by the Society of Ambulatory Anesthesia (SAMBA) that focuses on identifying risk factors, recommending strategies for reducing baseline risk, and identifying the most effective pharmacologic approach for PONV prevention (Nathan, 2020). This project achieved successful evidence-based implementation of PONV prevention guidelines through an approach of provider education. This will lead to adequate management of PONV and a decreased incidence of PONV with implications for improved overall patient outcomes.

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Appendix A

Apfel Risk Assessment Tool

Table 1 Assessment/Recommendations for prevention and management of PONV

Risk factors	Number of risk factors	PONV incidence	Prophylaxis strategy
	0	9%	None
Female gender	1	20%	4 mg dexamethasone ± 2nd antiemetic
Nonsmoker	2	39%	Avoid inhalation agents if possible +4 mg dexamethasone ± 2nd antiemetic
History of PONV or motion sickness	3	60%	Avoid inhalation agents if possible +4 mg dexamethasone + another prophylactic antiemetic (e.g., scopolamine patch)
Use of opioids >100 mcg fentanyl or equivalent	4	78%	Avoid inhalation agents if possible +4 mg dexamethasone + NK-1 Receptor Antagonist ± another prophylactic antiemetic (e.g., scopolamine patch)
Rescue strategy: antiemetic not used for prophylaxis, e.g., ondansetron 1 mg IV			

(Adapted from Apfel 2002) (11)

Simplified Apfel Assessment Tool

Risk Factor	Point Value	Points Assigned to Patient
Female	1	
History of motion sickness of PONV	1	
Nonsmoker	1	
Intraoperative or postoperative opioid	1	
Total points assigned to patient =		

Prophylactic Antiemetic Therapy Recommendations		
Score = 0 or 1	**Score = 2**	**Score = 3 or 4**
Ondansetron 4mg	Ondansetron 4 mg + Dexamethasone 8mg	Dexamethasone 8 mg or Ondansetron 4 mg + Scopolamine Patch

Appendix B

Jolley's Survey of Adaptation Questionnaire

Figure 1.

POSTOPERATIVE NAUSEA AND VOMITING QUESTIONNAIRE

This questionnaire is designed to assess the general level of understanding that nurses have about postoperative nausea and vomiting (PONV). All responses will be anonymous. Your cooperation will be gratefully appreciated.

Please answer true (T) or false (F) to each of the following statements:

1. On average, one in ten patients suffers from PONV after surgery ☐T ☐F
2. Women are more likely to suffer from PONV than men ☐T ☐F
3. The majority of patients are more worried about pain than PONV ☐T ☐F
4. PONV is unpleasant but rarely causes delay in recovery time after surgery ☐T ☐F
5. There is a strong relationship between travel sickness and PONV ☐T ☐F
6. Prolonged pre-operative fasting can result in PONV ☐T ☐F
7. Use of nitrous oxide by anesthetists is helping to reduce the incidence of PONV ☐T ☐F
8. Opioids can affect PONV because they increase gastric motility ☐T ☐F
9. When transporting back to the ward from the Recovery Room, the supine position is best for preventing PONV ☐T ☐F
10. If there is no evidence of gut distention, sips of fluid can usually be commenced two hours after surgery ☐T ☐F
11. Hypertension is more likely to cause PONV than hypotension ☐T ☐F
12. Nausea is a normal reaction to surgery and does not need any intervention unless it results in vomiting ☐T ☐F
13. Vomiting often brings relief to a patient with nausea, so it is worth waiting 30 minutes to see if symptoms persist before offering an anti-emetic drug ☐T ☐F
14. Smokers are more likely to experience PONV ☐T ☐F
15. PONV is more common following orthopedic surgery ☐T ☐F
16. Ginger is sometimes used for PONV ☐T ☐F
17. Dexamethasone is considered an effective anti-emetic, especially after laparoscopic surgery ☐T ☐F
18. Metoclopramide can cause drowsiness ☐T ☐F
19. Dimehydrinate is the drug of choice for patients experiencing PONV ☐T ☐F
20. Promethazine can be administered in any IV site ☐T ☐F

Correct Answers for PONV Survey

1. F 2. T 3. F 4. F 5. T 6. T 7. F 8. F 9. F 10. T 11. F 12. F 13. F 14. F 15. F 16. T 17. T 18. T 19. F 20. F

Survey Adaptation: S. Jolley (2000). Post-operative nausea and vomiting: A survey of nurses' knowledge. *Nursing Standard14*(23), 32-34.

Appendix C

Paired t Test Results

Data Set:

Group	Group One	Group Two
Mean	16.78	18.33
SD	1.64	1.22
SEM	0.55	0.41
N	9	9

P value and statistical significance:

The two-tailed P values is less than 0.0001

By conventional criteria, this difference is considered to be extremely statistically significant.

Confidence interval:

The mean of Group One minus Group Two equals – 1.56

95% confidence interval of this difference: From -1.96 – 1.15

Intermediate values used in calculations:

t = 8.8544

df = 8

standard error of difference = 0.176