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# Evaluating the Implementation of a Risk Screening Tool to Decrease the Incidence of Postoperative Nausea and Vomiting

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Evaluating the Implementation of a Risk Screening Tool to Decrease the Incidence of  
Postoperative Nausea and Vomiting

A DNP Project

Presented to the Faculty of the

Department of Nursing

West Chester University

West Chester, Pennsylvania

In Partial Fulfillment of the Requirements for

the Degree of

Doctor of Nursing Practice

By

Lauren E. Stoltzfus

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## Abstract

Postoperative nausea and vomiting (PONV) continues to occur despite medical advances over the years. PONV decreases patient satisfaction, can lead to postoperative complications such as dehydration and suture dehiscence, and it increases hospital costs. Evidence in the literature suggests a preoperative risk assessment screening and prophylactic antiemetic administration can decrease the incidence of PONV. The purpose of this project was to evaluate the effectiveness of a risk assessment tool and to determine if the tool would decrease the incidence of PONV. This quality improvement project involved collecting pre-intervention PONV data over a 6-week time period. The pre-intervention incidence was 17% ( $n=12$ ). A risk assessment tool was implemented in the perioperative surgical home area of the hospital where presurgical telephonic assessments were completed. Post intervention data was collected with regard to PONV incidence over a 6-week time period, resulting in an incidence of 19% ( $n=16$ ). No significant findings were established as a result from this quality improvement project. It is recommended to perform a similar quality improvement project with a larger sample size to achieve statistical significance as well as decrease the rate of PONV.

*Keywords:* postoperative nausea and vomiting, Apfel's simplified risk score, risk assessment tool, postoperative complications

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## **Chapter 1**

Postoperative Nausea and Vomiting (PONV) occurs in 10-80% of surgical patients (Smith, Haas, Zepp, & Klein, 2016). Seventy percent of those patients are assessed to be a high risk for PONV, which can often lead to post-surgical complications (Thomas, Maple, Norcross, & Muckler, 2019). The implementation of a PONV risk prediction and prophylaxis protocol can be implemented to be patient specific and tailored to the patient's risk factors and needs, leading to improved patient satisfaction and most importantly, a decrease in the incidence of PONV.

### **Background**

Risk factors for PONV can be difficult to pinpoint; however, various factors have been identified to increase one's risk. Gender, age, length of surgical procedure, genetics, and type of anesthetic used have all been linked with PONV (Squire & Spencer, 2018). The female gender carries a threefold increased risk for developing PONV (Squire & Spencer, 2018). Additionally, gynecological surgery itself is considered a risk factor because of both the female patient group and the length of surgeries (Squire & Spencer, 2018).

Prevention of PONV post-surgery can help increase patient satisfaction, improve healing time, and decrease length of stay (Smith & Ruth-Sahd, 2016). A consistent method to identify who is at risk for PONV can provide an effective treatment regimen. Assessing patients in preadmission testing can ensure the patient is identified before the onset of surgery and treated respectively. Additionally, patients who are a low risk for PONV can avoid exposure to antiemetic medications, which come with their own risks (Thomas, et al., 2019).

Risk assessment tools have been implemented in various studies to evaluate their effectiveness on the decrease of PONV. In a study performed by Thomas, et al. (2019), the

number of prophylactic antiemetics administered increased after the implementation of the risk prediction and prophylaxis tool. The incidence of PONV decreased from 32.3% to 28.9%, while the antiemetic compliance increased from 37% pre-implementation to 61% postimplementation (Thomas et al., 2019). In another study by Roberts, Barclay, and Scott (2010), researchers compared the use of a risk measurement tool versus anesthesiologists' subjective patient assessment. The risk assessment tool identified 51% of a group of gynecological patients were at a high risk for PONV, while the anesthesiologists' assessments only identified 25% of the same group of patients to be at a high risk.

### **Impact of PONV on Patient Care**

PONV impacts not only patient care outcomes, but also costs to a hospital or clinical setting. For those who experience PONV, these patients spend twice as long in the post anesthesia care unit (PACU) as compared to those who do not experience PONV (Thomas et al., 2019). The delay in discharge from the PACU impacts perioperative efficiency and disrupts the flow of patients from the operating room to the PACU, causing delays in care and compromising patient safety (Thomas et al., 2019).

PONV can impact the patient directly by resulting in poor quality of recovery and postoperative complications. Dehydration, electrolyte imbalance, pulmonary aspiration, suture dehiscence, and pneumothorax are all possible complications in the post-operative period (Smith et al., 2016 & Thomas et al., 2019). PONV also causes anxiety for patients preoperatively, with patients ranking PONV as the most undesirable postoperative outcome (Thomas et al., 2019).

## **Gap/Purpose**

Though there is evidence that the utilization of a PONV risk prediction and prophylaxis protocol can be successful, there is a need to perform more quality improvement projects and to prove its benefits. Because of this need, the primary investigator proposed a retrospective pre- and post-implementation quality improvement project. The designated hospital where the project took place did not utilize a risk assessment tool in its entirety. Patients were being screened for gender and a history of non-smoking status, but they were not being screened for a history of motion sickness/history of PONV. A thorough risk assessment tool addresses four predictors of PONV: female gender, history of motion sickness or PONV, non-smoking status, and planned use of opioids postoperatively (Apfel, Laara, Koivuranta, Greim, & Roewer, 1999). Patients were not specifically asked the predictor of planned use of postoperative opioids, as this is a decision for providers caring for the patient post-surgery.

In order to capture the risk score for PONV, the hospital created an algorithm within the electronic health record (EHR). As risk factors were identified, they were entered into the EHR. Because motion sickness was not being addressed within the screening phone call, the calculated score at the time of the prescreening phone call was incomplete. It was unclear if patients were a low, moderate, or high risk for PONV at this point in the pre-surgery screening. Additionally, nurses were not communicating the PONV risk score to providers. The purpose of this quality improvement project was to decrease the incidence of postoperative nausea and vomiting by fully implementing a PONV risk assessment tool, specifically inquiring about a history of motion sickness, and communicating that risk score to providers.

## **Clinical Questions**

In scheduled surgical patients (P), how does the use of a risk assessment tool in its entirety (I), compared to current practice of not utilizing the entire risk assessment tool (C), affect the incidence of postoperative nausea and vomiting (O) within a 6-week time period (T)?

1. Does adding *motion sickness* to the prescreening phone calls decrease PONV rates?
2. Does identifying high risk patients during the prescreening phone call phase decrease PONV rates?

## **Project Objectives**

- Examine whether the current practice of prescreening questions will need to be amended based on the results of this project.
- Determine if the full risk assessment tool should or should not be implemented at the hospital.
- Improve patient care outcomes by conducting a thorough risk assessment for PONV.
- Improve patient care outcomes by communicating PONV risk scores to providers.

## **Methodology**

The project used a retrospective pre- and post- implementation quality improvement design. The data for this project was extracted from the electronic health record (EHR) where it was documented if the patient experienced nausea and/or vomiting in the post anesthesia care unit (PACU). The data extracted during the pre-implementation phase provided a baseline of PONV incidence. After pre implementation data was collected,

introduction of the full Apfel Simplified Risk Score for PONV, including a history of motion sickness, was introduced to the staff in the perioperative surgical home department.

Educational sessions were held for nursing staff regarding the use and implementation of the tool. The post implementation data was extracted similarly to the pre implementation phase.

## **Chapter 2**

The Literature Review will discuss studies and quality improvement projects on postoperative nausea and vomiting (PONV) and the use of a risk assessment tool and prophylaxis protocol. Additionally, a theoretical framework will be explored, specifically its relation to this quality improvement project. The review is divided into the following sections: a) terms and concept definitions b) theoretical framework, c) review of literature, (d) summary and research gaps, and (e) purpose statement.

### **Term/Concept Definitions**

For the purposes of this quality improvement project, postoperative nausea and vomiting is defined as nausea and vomiting that occurs within the first 24-hour period after surgery (American Society of PeriAnesthesia Nurses [ASPAN], 2006). Nausea is a self-report of an unpleasant feeling in the epigastrium or the back of the throat (ASPAN, 2006). Some patient descriptors include, but are not limited to “feeling sick to my stomach” and “feeling queasy” (ASPAN, 2006). Vomiting, as defined by ASPAN (2006), is the forceful expulsion of the contents of the stomach, duodenum, and jejunum through the oral cavity. Prophylaxis is defined as the use of antiemetic medications before the onset of symptoms of PONV. Risk factor refers to an independent predictor of a future occurrence of an event or incident (ASPAN, 2006). Rescue antiemetics are defined as antiemetic medications that are used after the onset of nausea and vomiting postoperatively.

### **Theoretical Framework**

Postoperative nausea and vomiting can be one’s response to environmental factors such as the type of anesthesia used, being a non-smoker, a history of PONV or motion sickness, and postoperative opioid use. Female gender is another risk factor that can lead to

PONV. Neuman Systems Model was used as the theoretical framework because it focused on client system wellness and environmental stressors that threaten one's optimal system stability (Fawcett, 2017). In this quality improvement project, the goal was for the client to maintain wellness, despite environmental stressors and one's response to those stressors. Optimal system stability is described as the best possible wellness state of an individual at any given time (Neuman & Fawcett, 2011). Neuman Systems Model is a holistic and system-based approach to the person and their response to actual or potential environmental stressors (Fawcett, 2017). There are various components of the systems model. Prevention as Intervention was chosen because it correlates with the risk assessment and prophylaxis protocol regarding PONV (Figure 1). The model has three types of prevention that promote wellness: primary, secondary, and tertiary (Neuman & Fawcett, 2011). Reducing risk factors and preventing identified or suspected stressors before the client experiences them, also known as retaining wellness, is the first step of Neuman's model (Zaccagnini & White, 2017). Assessing all patients to identify if they may be at risk for PONV will fall under the primary type of prevention. In the secondary prevention phase, the goal is to intervene in order to strengthen internal resistance to stressors (Neuman & Fawcett, 2011). Here, the implementation of the prophylactic antiemetics would take place. Lastly, the tertiary prevention phase is defined as the protection of the wellness that was attained from the secondary prevention and support the client's strengths and energy reserves (Neuman & Fawcett, 2011). This phase supports the patient's wellness they attained from having the prophylactic antiemetics and supports the patient during the acute recovery phase.

## **Review of Literature**

A detailed review of literature was conducted using CINAHL, Google Scholar, and MEDLINE. The key words, or search terms, used included postoperative nausea and vomiting, postoperative nausea and vomiting risk assessment, risk of postoperative nausea and vomiting, and postoperative nausea and vomiting prophylaxis. The inclusion criteria included the primary language as English, peer reviewed, and published between 2009 and 2019. Exclusion criteria were studies that had a narrow focus on specific antiemetic drugs as prophylaxis; studies that did not primarily involve PONV; and studies where the patient population was primarily pediatric. A total of 12 articles were selected based on the relevance of topic to this literature review. These articles included literature reviews to assess any gaps in research, implementation of quality improvement projects to support and provide evidence to the topic, and multivariable analyses to determine the effectiveness of risk assessment tools.

According to the findings from the articles selected, utilization of a risk assessment and prophylactic protocol yielded a number of benefits. Common findings include a decrease in PONV comparing pre-implementation and post-implementation groups, identification of risk factors, the use of simplified risk scores, and compliance by anesthesia providers of an antiemetic prophylaxis protocol (Tabrizi, Malhotra, Turnbull, & Goode, 2019; Smith, Haas, Zepp, & Klein, 2016; Thomas, Maple, Norcross, & Muckler, 2019)).

When referring to identification of risk factors for PONV, studies showed that various factors can lead to PONV, including patients' gender and age, anesthetics used, and surgical variables, such as type of surgery (Kim et al., 2013). Apfel's simplified risk score for predicting PONV consists of four risk factors: female gender, nonsmoking history, history of

PONV or motion sickness, and the use of postoperative opioids. Female gender is identified as a significant risk factor for PONV. According to Smith & Ruth-Sahd (2016) and Collins (2019), females have more than a two and a half times greater chance of experiencing PONV regardless of age or menstrual status. By identifying individuals at high risk for PONV, those at low risk can be eliminated from being treated with prophylactic antiemetic therapy (Chatterjee, Rudra, & Sengupta, 2011; Apfel et al., 2012).

Simplified risk scores have been both reliable and valid in identifying risk factors and providing appropriate antiemetics (Pierre & Whelan, 2013). The most commonly found and used risk scores are Apfel's Simplified Risk Score and Koivuranta Simplified Risk Score. Studies have supported the use of the latter scores in that they are simple, containing between four and five risk factors, both identifying the higher the score, the higher the risk of PONV (Apfel et al., 2012; Smith et al., 2016). Studies have shown that with the use of the simplified risk scores, anesthesia providers can be presented with a PONV risk score accompanied with recommendations on the number of prophylactic antiemetics to administer based on that individual's risk (Kappen et al., 2015; Smith Merckx, Peuch, Necib, & Pingeon, 2010). Because the steps are simplified and recommendations are provided directly to the anesthesia provider, compliance of the screening tool and prophylaxis protocol has been reached (Tabrizi et al., 2019). With proper screening and proper administration of antiemetics, studies have shown a decrease in PONV and improved patient satisfaction (Tabrizi et al., 2019; Smith et al., 2016; Sigaut et al., 2010).

### **Summary and Research Gaps**

Research has proven that with the use of a simplified risk score and prophylactic protocol, reduction in PONV is possible and compliance by providers can be achieved.

Patients reported a decrease in nausea and vomiting within 24 hours postoperatively, showing success in a multitude of studies. Some noted gaps in research, however, include the lack of monitoring and assessing patients for a full 24 hours postoperatively. Most studies evaluated patients in an ambulatory setting, only monitoring their PONV status between one and six hours (Smith et al., 2016). Lastly, studies have been difficult to compare due to the various study designs and analyses performed (Thomas et al., 2019). Designs, as well as inclusion criteria, differed from study to study. Kappen et al., (2015) recommends to perform a project with the same design, analysis, and inclusion criteria in a multi-campus health system as to adequately evaluate and critique the results.

The purpose of this DNP Project was to evaluate the implementation of a simplified risk score and its ability to decrease the incidence of postoperative nausea and vomiting in scheduled surgical patients.

## **Chapter 3**

### **Design**

This project used a retrospective pre and post implementation quality improvement design. This approach was chosen due to its success in other studies. Thomas, Maple, Norcross, & Muckler (2019) utilized a pre and post implementation design yielding a decrease in the incidence of postoperative nausea and vomiting (PONV). Additionally, Smith, Haas, Zepp, & Klein (2016) proved the reduction of PONV in the PACU setting with the use of a pre-and post-intervention design. The data for this project was collected from the electronic health record (EHR) where it was documented that the patient experienced nausea and/or vomiting in the post anesthesia care unit (PACU). The data collected during the pre-implementation phase provided a baseline of PONV incidence. The post implementation data was extracted similarly to the pre implementation phase. The pre and post implementation data was compared and analyzed.

### **Setting**

The setting for the practice change initiative occurred in a Mid-Atlantic urban, 506 bed hospital located in central Pennsylvania. The hospital is part of a large not-for-profit healthcare organization that holds Magnet designation for nursing excellence. Approximately 12,000 outpatient surgeries occur per year within the organization. Participants in the setting were from the operative suite, focusing in the Perioperative Surgical Home (where prescreening phone calls occur) and the following three areas where participants may receive antiemetics: pre-procedure area, the operating room, and the PACU.

## **Population/Sample**

Subjects for this project were adult patients undergoing a scheduled surgery. Inclusion criteria included English speaking patients 18 years of age and older. Subjects were excluded for the following: pregnancy, admission to the intensive care unit after surgery, and mechanical ventilation support overnight after surgery. The sample size for pre implementation and post implementation needed to be approximately 350 subjects per group to achieve statistical significance using a two-tailed sequential likelihood test. The factors used to determine the sample size were the following: 99% confidence interval, expected relative effect size of a 25% reduction in PONV, and a baseline PONV rate of 32% per Thomas, Maple, Norcross, & Muckler (2019). All patients who met the criteria were included in the project.

## **Data Collection**

Every effort was made to protect the private health information of the subjects. In order to ensure that patient confidentiality was protected, Institutional Review Board (IRB) approval through West Chester University and the hospital was obtained and granted from both institutions (Appendices A & B).

All data was de-identified during collection. Identification numbers were placed on documentation forms and stored in a locked cabinet in a secured office in the hospital. Informed consent was required, as this was not defined as a research study.

The collection of data occurred within the hospital's existing electronic charting system. The staff documented the presence of nausea and/or vomiting with the assessment flowsheet portion of the EHR. Data was manually extracted regarding the flowsheet rows specific to nausea and vomiting documentation.

## **Instruments**

After pre implementation data was collected, introduction of the Apfel Simplified Risk Score for PONV was reviewed with the staff of the perioperative surgical home department. The Apfel Simplified Risk Score for PONV objectively quantifies risks for PONV and recommends prophylactic antiemetics based on the patient's individual risk for developing PONV (Thomas et al., 2019). The risk assessment tool assigns each risk factor one point and the cumulative number of points equates to the patient's individual risk for PONV (Thomas et al., 2019). Risk factors include post-operative opioids, non-smoker, female gender, and history of PONV/motion sickness. Scores are divided into low risk (0-1 points), moderate risk (2 points), and high risk (3 or more points). Scores can range from 0-4 with the corresponding risk for PONV to be 10%, 20%, 40%, 60%, and 80% respectively (Thomas et al., 2019). Additionally, an algorithm links risk severity with treatment recommendations.

## **Implementation**

The primary investigator educated and supported nursing staff in assessing patients for PONV by utilizing the Apfel Simplified Risk Score, specifically focusing on the criteria of motion sickness. Education was provided in staff meetings and during informal presentations/in-services to Perioperative Surgical Home (PSH) staff, PACU staff, and anesthesia providers. The primary investigator and selected champions provided live support during the implementation of the risk assessment tool. Registered nurses from the PSH who screen patients via the telephone asked patients if they have had a history of motion sickness. If the patient answered "yes" to motion sickness, the nurse entered "motion sickness" into the patient's past medical history as well as into a comment box labeled "HPI" (history of

present illness) within the patient's EHR. A second screening team consisting of two nurse practitioners and one anesthesiologist reviewed the patient's EHR. If a patient had been identified as having motion sickness in the past, the second screening team called the patient to inquire about the severity of the motion sickness and any treatments they had used in the past to treat it. The second screening team used their discretion and clinical experience to determine if a call to the patient was warranted. It was not guaranteed the patient would receive a call. The second screening team referred treatment recommendations and orders to the primary surgery team. For patients who screened "yes" for motion sickness, the second screening team recorded the patient's medical record number and date of surgery on a master list (Appendix C). The master list was kept in a purple folder labeled "PONV Screening" which was located on the second desk to the left within the Perioperative Surgical Home Office. The primary investigator collected this on a regular basis.

The primary investigator collected data through a chart review of PONV in English speaking, scheduled surgical patients 18 years of age and older within the project timeline. A spreadsheet was utilized to collect and organize patient data (Appendix D). All identifying patient information was de-identified and was included in the data collection. Each case was evaluated for utilization of the Apfel tool, specifically the criteria of motion sickness, the patient's risk score according to the tool, and the incidence of PONV. Data collection took place over a 6-week period.

### **Planning/Timeline**

When planning this project, support for practice change came from key stakeholders. The researcher met with the manager of anesthesia services, anesthesia providers, and staff nurses in the operative suite to identify the processes that occurred during the practice

change. Throughout the planning process, the primary investigator met with staff during staff meetings to educate them on the project and protocol that was implemented. A timeline was shared with staff and key stakeholders providing them with a guide of educational sessions, roles of the nurses, roles of anesthesia providers, and dates of implementation (see Appendix E).

### **Budget**

The budget for this quality improvement project was minimal. The primary investigator spent under \$300 to feed staff members during inservices and educational sessions. There was no direct incurred cost to the hospital. There was no cost for a statistician.

### **Data Analysis**

A categorical two-sample  $t$  test was conducted to ensure pre implementation and post implementation groups were statistically equivalent. To identify a change in PONV incidence pre/post implementation a two-tailed sequential likelihood test was used. An Alpha of 0.05 was used.

### **Key Stakeholders**

The main stakeholders of this project included, but were not limited to, patients who had a scheduled outpatient surgery, the staff nurses within the PSH, the preoperative suite, the operating room and the PACU, providers who worked within the PSH, such as two nurse practitioners and one anesthesiologist, anesthesia providers, and hospital leaders who trusted staff within the hospital to provide safe and effective care to patients.

### **Plan for Dissemination to Key Stakeholders**

The primary investigator discussed strengths, weaknesses, opportunities, and results of this project with the staff and hospital leadership teams. A written report and PowerPoint presentation was provided to show statistical findings. Recommendations were made for future practice change.

## Chapter 4

### Results

This project used a retrospective pre-and post- implementation quality improvement design to determine if the use of a risk assessment tool led to a decrease in PONV rates. Pre-intervention results were collected between December 23, 2019 and February 2, 2020. There were 12 participants in the pre-intervention group. Post-intervention results were collected between February 3, 2020 and March 15, 2020. There were 16 participants in the post-intervention group.

The null hypothesis was that there was no significant difference in the incidence of postoperative nausea and vomiting between pre- and post-intervention of a risk assessment tool in scheduled outpatient surgeries. For the pre-intervention group, 2 of the 12 participants (17%) experienced PONV. For the post-intervention group, 3 of the 16 participants (19%) experienced PONV.

The pre-intervention group consisted of 6 females and 6 males, and the post-intervention group consisted of 14 females and 2 males. Pre-intervention males had a 17% incidence of PONV, while zero post-intervention males experienced PONV. Seventeen percent of females in the pre-intervention group experienced PONV and 21% of the females in the post intervention group experienced PONV (Table 1). All participants in the pre-intervention group received general anesthesia, with 17% experiencing PONV (Table 2). Eight percent of those who experienced PONV in the post-intervention group received general anesthesia, while 67% of participants who experienced PONV in the post-intervention group received spinal anesthesia (Table 2).

Table 3 shows the distribution of PONV rates by the Apfel risk score. Of the participants in the pre-intervention group, 25% of the participants with a risk score of zero presented with PONV, and 25% of the participants with a risk score of two also experienced PONV. In the post-intervention group, 20% of the participants with a score of two, 20% with a score of three, and 20% with score of four experienced PONV.

Table 4 summarizes each risk factor for PONV. Participants may have zero, one or multiple risk factors in both the pre and post intervention groups. In the pre-intervention group, 17% of the participants who were female experienced PONV. In the post-intervention group, 21% of the participants who were female experienced PONV. When referring to the risk factor of a history of motion sickness and/or PONV, the pre-intervention group was not consistently screened. One participant had this risk factor, yet no pre-intervention participants with this risk factor experienced PONV. For the post intervention group, all participants were screened for a history of motion sickness/PONV, and 20% of them experienced PONV. Fourteen percent of participants in the pre-intervention group and 22% in the post intervention group were non-smokers and also experienced PONV. Lastly, zero participants in the pre-intervention group and 11% in the post intervention group who had a risk factor for planned postoperative opioids experienced PONV.

### **Analysis**

A two-tailed sequential likelihood test was used to identify a change in PONV incidence. The PONV rate was 12.5% higher in the post-intervention group, with a *p* value of 0.433. The *p* value was greater than the chosen Alpha (0.05), meaning the null hypothesis could not be rejected.

A categorical two-sample  $t$  test was conducted to ensure pre implementation and post implementation groups were statistically equivalent. The test was used to compare the categorical results of the Apfel risk assessment score for pre and post intervention groups. The null hypothesis assumed the means were equivalent. The test results had a mean score of 1.3 in the pre-intervention group and a mean score of 2.9 in the post-intervention mean. The  $t$  test had a  $p$  value of 0.001. The  $p$  value was less than Alpha of 0.05, thus rejecting the null hypothesis and concluding that the population in the pre-intervention group was different than the population in the post intervention group.

## Chapter 5

### Discussion

Postoperative nausea and vomiting causes complications such as delayed healing time, increased length of stay, and decreased patient satisfaction (Smith & Ruth-Sahd, 2016). Various factors have been identified to increase one's risk for developing PONV including gender, a history of PONV or motion sickness, a history of non-smoking, and the use of opioids postoperatively (Squire & Spencer, 2018). By implementing a risk assessment tool to identify risk factors before surgery and treat the patient with appropriate antiemetics, the rate of PONV may be decreased.

The purpose of this quality improvement project was to evaluate the implementation of a simplified risk score and its ability to decrease the incidence of postoperative nausea and vomiting in scheduled surgical patients. The key findings of this project were not ideal. Due to a small sample size and varying populations between the pre and post-intervention groups, the rate of PONV did not decrease.

Although the null hypothesis could not be rejected, this quality improvement project did identify clinical significance among the participants who experienced PONV. Female participants experienced PONV more frequently than male participants, a finding supported in a study by Squire & Spencer (2018) (Table 1). Seventeen percent of participants who experienced PONV in the pre-intervention group received general anesthesia. In the post intervention group, 67% of those who experienced PONV received spinal anesthesia and eight percent received general anesthesia (Table 2). According to Tabrizi et al. (2019), patients tend to experience PONV when volatile anesthetics, such as those used in general

anesthesia, are used. Completing a project in the future with a larger sample size may be beneficial to further examine anesthesia types and their correlation to PONV.

The distribution of PONV rates by the Apfel risk score was difficult to compare between the pre and post-intervention groups because participants in the pre-intervention group were not consistently screened for *motion sickness*. When referring to the Apfel risk score, low scores indicate a lower risk for PONV, whereas high scores, such as three or four, indicate a higher risk for PONV (Apfel, Laara, Koivuranta, Greim, & Roewer, 1999). In the pre-intervention group, participants with scores of zero and two did experience PONV. In the post intervention group, participants who did experience PONV had scores of two, three, and four (Table 3). Adding *motion sickness* to the prescreening phone call process did identify participants who could be more at risk for PONV; however, it did not lead to an increased use of antiemetic mediations preoperatively or an overall decrease in PONV rates in this quality improvement project. When looking at each risk factor of PONV (female gender, history of motion sickness/PONV, non-smoker, and planned postoperative use of opioids), the quality improvement project was not able to identify statistically significant findings (Table 4), though it did identify clinical significance as previously discussed.

### **Application of Theoretical Framework**

This project correlates with Neuman Systems Model *Prevention as Intervention*. By applying the Apfel Risk Assessment to participants during the intervention phase, including the risk factor of motion sickness, *primary* prevention was instituted. Participants were assessed for risk factors and identified for the potential of an increased risk for PONV. When the nurses notified providers of the participants' increased risk for PONV, the *secondary* prevention phase occurred, allowing the providers the opportunity to intervene and

promote the use of antiemetics before surgery. Neuman's third phase, the *tertiary* prevention phase, supports the wellness of participants' experience after receiving antiemetics prophylactically (Neuman & Fawcett, 2011). Although participants did not always receive antiemetics prophylactically and the incidence of PONV did not decrease, participants' overall wellness was still addressed and antiemetics were administered if PONV did occur.

### **Implications for Practice, Education, & Policy**

This quality improvement project led to implications for both practice and policy changes. Nursing education and possible changes to curriculum were evaluated, though implications for changes were not indicated. Implications for practice include increased communication between nursing and anesthesia providers. Nursing can communicate high risk patients (scores of 3 or 4) to the anesthesia providers. Additionally, implementing a prophylaxis protocol that anesthesia providers can utilize can be beneficial. Once the Apfel risk score is identified, providers can tailor the use of antiemetics according to the patient's degree of risk for PONV.

Possible policy changes include the implementation of a policy on proper PONV documentation for nursing staff. Nursing staff in the perioperative surgical home department should be required to ask all patients if he/she has a history of motion sickness. This will allow thorough and non-biased assessment and documentation for PONV for all scheduled surgery patients. Also, a policy can be implemented regarding proper documentation of PONV. There were inconsistencies regarding where within the EHR nurses should document PONV. By instituting a policy, proper documentation can occur, reports can accurately be extracted, and data can be appropriately analyzed.

## **Limitations**

The most notable limitation of this quality improvement project was the small sample size. Data had been extracted manually, but due to a world-wide pandemic and policies of strict social distancing, the primary investigator was unable to physically enter the hospital and continue to manually collect data. The primary investigator analyzed the data that was collected prior to the pandemic which resulted in a small sample size. Not having an electronic report to collect the data was also a notable limitation for this project. Manually extracting the data was time consuming and limited the number of participants, specifically because of the pandemic. Additionally, the pre and post-intervention groups were not similar in population. The post-intervention group was consistently screened for motion sickness and the pre intervention group was not, creating a selection bias.

Another limitation that was noted with this quality improvement project included the inconsistency of PONV documentation. Nurses in PACU and on inpatient units were not consistently documenting PONV. Upon review of patients' EHRs and their medication administration records, it was noted that at times antiemetics were administered, yet it was not consistently documented that PONV occurred. Additionally, some nurses in the PACU were documenting PONV under a gastrointestinal focused assessment, while other nurses were documenting it under a nutrition focused assessment. When the primary investigator performed chart reviews to extract data, there were numerous places she needed to look to identify if the patient experienced PONV.

## **Recommendations**

A recommendation for future quality improvement projects is to replicate this project, but have a larger sample size in order to maximize post-surgical outcomes. To obtain a

larger sample size, the primary investigator should extract and analyze data on all surgical patients; not just for those who could manually be extracted. By creating an electronic report that extracts data, the primary investigator can more efficiently and effectively extract and analyze data on all surgical patients. With an increase in sample size, it would be hopeful to identify statistically significant findings as well as further validate clinical findings.

It is recommended to continue to preoperatively screen patients for motion sickness in order to further evaluate the effects of the Apfel tool on overall PONV incidence. Nursing can play a more integral role in a future project by regularly screening patients for all PONV risk factors and by also consistently documenting and reporting PONV. Educating staff on where to appropriately document PONV within the EHR will provide a more thorough and robust project. Nursing can also advocate for their patients by verbally reporting high-risk patients, those with a score of three or four, directly to anesthesia providers. By verbally communicating this to the anesthesia providers, nursing can ensure the providers are aware. Nursing can also recommend treatment options, such as the use of a scopolamine patch, an antiemetic commonly used to prevent or decrease PONV.

Additionally, creating a compliance policy for anesthesia providers may benefit future studies. By having anesthesia providers be responsible for following a protocol once the Apfel risk score is identified, proper antiemetics can be administered, thus promoting a possible decrease in PONV rates.

## **Conclusion**

Postoperative nausea and vomiting is an ongoing complication post-surgery. With the implementation of a risk assessment tool, at risk patients can be identified and prophylactically treated. The outcomes of this project reinforce the need for collaborative

care from various members of the healthcare team. By incorporating nurses and anesthesia providers into the thorough assessment of patients and their risk factors, PONV can be more closely analyzed and treated.

## References

- American Society of PeriAnesthesia Nurses. (2006). ASPAN's evidence-based clinical practice guideline for the prevention and/or management of PONV/PDNDV. *Journal of PeriAnesthesia Nursing*, 21(4), 230-250.  
<https://doi.org/doi:10.1016/j.jopan.2006.06.003>
- Apfel, C. C., Heidrich, F. M., Jukar-Rao, S., Jalota, L., Hornuss, C., Whelan, R. P., ... Cakmakkaya, O. S. (2012). Evidence-based analysis of risk factors for postoperative nausea and vomiting. *British Journal of Anaesthesia*, 109(5), 742-753.  
<https://doi.org/10.1093/bja/aes276>
- Apfel, C. C., Laara, E., Koivuranta, M., Greim, C., & Roewer, N. (1999). A simplified risk score for predicting postoperative nausea and vomiting: Conclusions from cross-validations between two centers. *Anesthesiology*, 91(3), 693-700. Retrieved from <https://anesthesiology.pubs.asahq.org/Article.aspx?articleid=1946036>
- Chatterjee, S., Rudra, A., & Sengupta, S. (2011). Current concepts in the management of postoperative nausea and vomiting. *Anesthesiology Research and Practice*, 2011, 1-10. <https://doi.org/10.1155/2011/748031>
- Collins, A. S. (2019). Postoperative nausea and vomiting in adults: implications for critical care. *Critical Care Nurse*, 31(6), 36-45. Retrieved from <http://ccn.aacnjournals.org/>
- Fawcett, J. (2017). *Applying conceptual models of nursing: Quality improvement, research, and practice*. Retrieved from [https://sshelco-primo.hosted.exlibrisgroup.com/primo-explore/fulldisplay?docid=01SSHELCO\\_WCHESTER\\_ALMA51154249980003573&context=L&vid=WCHESTER&lang=en\\_US&search\\_scope=default\\_scope&adapter=Local%20Search%20Engine&tab=default\\_tab&query=any,contains,neuman%27s%20systems%20model&mode=Basic](https://sshelco-primo.hosted.exlibrisgroup.com/primo-explore/fulldisplay?docid=01SSHELCO_WCHESTER_ALMA51154249980003573&context=L&vid=WCHESTER&lang=en_US&search_scope=default_scope&adapter=Local%20Search%20Engine&tab=default_tab&query=any,contains,neuman%27s%20systems%20model&mode=Basic)

- Kappen, T. H., Vergouwe, Y., Van Wolfswinkel, L., Kalkman, C. J., M. Moons, K. G., & Van Klei, W. A. (2015). Impact of adding therapeutic recommendations to risk assessments from a prediction model for postoperative nausea and vomiting. *British Journal of Anaesthesia*, *114*(2), 252-260. <https://doi.org/10.1093/bja/aeu321>
- Kim, S. H., Shin, Y., Oh, Y. J., Lee, J. R., Chung, S. C., & Choi, Y. S. (2013). Risk assessment of postoperative nausea and vomiting in the intravenous patient-controlled analgesia environment: Predictive values of the Apfel's Simplified Risk Score for identification of high-risk patients. *Yonsei Med J*, *54*(5), 1273-1281. <https://doi.org/10.3349/ymj.2013.54.5.1273>
- Neuman, B., & Fawcett, J. (2011). *The Neuman Systems Model* (5th ed.). [Kindle]. Retrieved from [www.amazon.com](http://www.amazon.com)
- Pierre, S., & Whelan, R. (2013). Nausea and vomiting after surgery. *Continuing Education in Anaesthesia, Critical Care & Pain*, *3*(1), 28-32. <https://doi.org/10.1093/bjaceaccp/mks046>
- Roberts, A., Barclay, P., & Stott, M. (2010). Improving the accuracy of risk assessment in postoperative nausea and vomiting. *Anaesthesia*, *65*(), 857-866. <https://doi.org/doi:10.1111/j.1365-2044.2010.06437.x>
- Sigaut, S., Merckx, P., Peuch, C., Necib, S., & Pingeon, F. (2010). Does an educational strategy based on systematic preoperative assessment of simplified Apfel's score decrease postoperative nausea and vomiting. *Annales Francaises d'Anesthesie et de Reanimation*, *29*(11), 765-769. <https://doi.org/10.1016/j.annfar.2010.08.004>
- Smith, C. A., Haas, R. E., Zepp, J. C., & Klein, M. (2016). Improving the quality of post-anesthesia care: An evidence based initiative to decrease the incidence of

- postoperative nausea and vomiting in the post anesthesia care unit. *Perioperative Care and Operating Room Management*, 4, 12-16.
- <https://doi.org/10.1016/j.pcorn.2016.08.003>
- Smith, C. A., & Ruth-Sahd, L. (2016). Reducing the incidence of postoperative nausea and vomiting begins with risk screening: An evaluation of the evidence. *Journal of PeriAnesthesia Nursing*, 31(2), 158-171. <https://doi.org/10.1016/j.jopan.2015.03.011>
- Squire, Y., & Spencer, R. (2018). Postoperative nausea and vomiting. *Anaesthesia and Intensive Care Medicine*, 19(9), 475-479. <https://doi.org/DOI:10.1016/j.mpaic.2018.06.009>
- Tabrizi, S., Malhotra, V., Turnbull, Z. A., & Goode, V. (2019). Implementation of postoperative nausea and vomiting guidelines for female adult patients undergoing anesthesia during gynecologic and breast surgery in an ambulatory setting. *Journal of PeriAnesthesia Nursing*, 34(4), 851-860. <https://doi.org/10.1016/j.jopan.2018.10.006>
- Thomas, J. S., Maple, I. K., Norcross, W., & Muckler, V. C. (2019). Preoperative risk assessment to guide prophylaxis and reduce the incidence of postoperative nausea and vomiting. *Journal of PeriAnesthesia Nursing*, 34(1), 74-85. <https://doi.org/DOI:10.1016/j.jopan.2018.02.007>
- Zaccagnini, M. E., & White, K. W. (2017). *The doctor of nursing practice essentials* (3 ed.). Burlington, MA: Jones & Bartlett Learning.

Table 1

*PONV Rates by Gender*

Gender	Pre-intervention	Post-intervention
Male	1 (17%, n=6)	0 (0%, n=2)
Female	1 (17%, n=6)	3 (21%, n=14)
Total	2 (17%, n=12)	3 (19%, n=16)

*Note.* Percentages represent the percentage of participants who experienced PONV.

Table 2

*PONV Rates by Anesthesia Type*

Anesthesia Type	Pre-intervention	Post-intervention
General	2 (17%, n=12)	1 (8%, n=12)
Spinal	0 (0%, n=0)	2 (67%, n=3)
MAC	0 (0%, n=0)	0 (0%, n=1)
Total	2 (17%, n=12)	3 (19%, n=16)

*Note.* Percentages represent the percentage of participants who experienced PONV.

Table 3

*PONV Rates by Apfel Risk Score*

Apfel Risk Score	Pre-intervention	Post-intervention
0	1 (25%, n=4)	0 (0%, n=0)
1	0 (0%, n=2)	0 (0%, n=1)
2	1 (25%, n=4)	1 (20%, n=5)
3	0 (0%, n=2)	1 (20%, n=5)
4	0 (0%, n=0)	1 (20%, n=5)
<b>Total</b>	<b>2 (17%, n=12)</b>	<b>3 (19%, n=16)</b>

*Note.* Percentages represent the percentage of participants who experienced PONV.

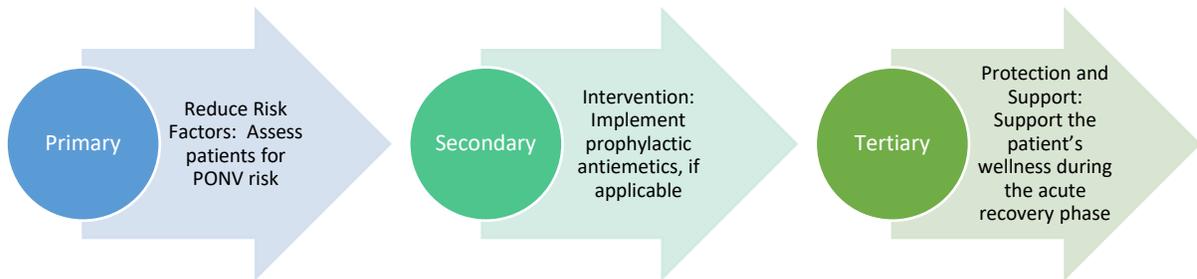
Table 4

*PONV Rates by PONV Risk Factor Predictors*

PONV Risk Factor Predictors	Pre-intervention	Post-intervention
Female gender	1 (17%, n=6)	3 (21%, n=14)
History of motion sickness or PONV	0 (0%, n=1)	3 (20%, n=15)
Nonsmoker	1 (14%, n=7)	2 (22%, n=9)
Postoperative opioids	0 (0%, n=2)	1 (11%, n=9)

*Note.* Percentages represent the percentage of participants who experienced PONV.

Figure 1



*Figure 1.*  
Neuman Systems Model, Prevention as Intervention applied to risk assessment and prophylaxis protocol regarding PONV (Neuman & Fawcett, 2011).

Appendices

Appendix A: Institutional Review Board Approval, West Chester University



Office of Research and Sponsored Programs | West Chester University | Ehinger Annex  
West Chester, PA 19383 | 610-436-3557 | www.wcupa.edu

**Protocol ID # 20191223B**  
*This Protocol ID number must be used in all communications about this project with the IRB.*

TO: Lauren Stoltzfus and Cheryl Monturo  
FROM: Nicole M. Cattano, Ph.D.  
Co-Chair, WCU Institutional Review Board (IRB)  
DATE: 12/23/2019

**Project Title: Reducing the Incidence of Postoperative Nausea and Vomiting with a Risk Assessment Tool: A Quality Improvement Project**

**Notification of Initial Study Exemption Determination**

**Exempt From Further Review**

This Initial Study submission meets the criteria for exemption per the regulations found at 45 CFR 46.104 (4). As such, additional IRB review is not required.

The determination that your research is exempt does not expire, therefore, annual review is not required and no expiration date will be listed on your approval letter. If changes to the research are proposed that would alter the IRB's original exemption determination, they should be submitted to the WCU IRB for approval, using the IRB application form (check off I.G. Revision).

Your research study will be archived 3 years after initial determination. If your Exempt study is archived, you can continue conducting research activities as the IRB has made the determination that your project met one of required exempt categories. The only caveat is that no changes can be made to the application. If a change is needed, you will need to submit a NEW Exempt application. Please see [www.wcupa.edu/research/irb.aspx](http://www.wcupa.edu/research/irb.aspx) for more information.

However, it is very important that you close-out your project when completed or if you leave the university. Faculty mentors are responsible for oversight of student projects and should ensure exempt studies are completed and closed-out before the student leaves the university.

The Principal Investigator and/or faculty mentor is responsible for ensuring compliance with any applicable local government or institutional laws, legislation, regulations, and/or policies, whether conducting research internationally or nationally. Please contact the WCU Office of Sponsored Research and Programs at [irb@wcupa.edu](mailto:irb@wcupa.edu) with any questions.

Sincerely,

A handwritten signature in black ink, appearing to read "Nicole M. Cattano".

Co-Chair of WCU IRB

WCU Institutional Review Board (IRB)  
IORG#: IORG0004242  
IRB#: IRB00005030  
FWA#: FWA00014155

*West Chester University is a member of the State System of Higher Education*

Appendix B: Institutional Review Board Approval, Hospital



INSTITUTIONAL REVIEW BOARD

January 21, 2020

Lauren Stoltzfus, MSN, RN, CNE  
West Chester University  
Department of Nursing, Office # 127  
930 East Lincoln Highway  
Exton, PA 19341

Re: Reducing the Incidence of Postoperative Nausea and Vomiting with a Risk  
Assessment Tool: A Quality Improvement Project  
**Protocol Number: 2019-68**

Dear Ms. Stoltzfus:

On January 17, 2020, a designee representing the Chair of the Institutional Review Board (IRB) of the Lancaster General Hospital conducted a review of the above-mentioned project. The designee determined the project does not constitute human subjects' research and therefore 45 CFR part 46 does not apply.

This project is not subject to further IRB review unless changes are made to the project.

Sincerely,

A handwritten signature in purple ink that reads "Doreen W. Bett, DO".

Doreen W. Bett, DO  
Chair, Institutional Review Board

DWB:tp





## Appendix E: Proposed Timeline

### November 2019-January 2020

- Researcher will meet with key stakeholders and clinical staff to obtain support
- Researcher will learn the workflow of the nurses and anesthesia providers in the surgical suite
- Researcher will meet with preceptor to discuss details of the project
- Submit IRB application to WCU
- Submit IRB application to proposed hospital site
- Gather retrospective data (6 weeks-worth)
- Obtain champions to help implement practice change
- Educate staff on the practice change and use of the Apfel Risk Assessment Score, specifically motion sickness

### February 2020 – March 2020

- Meet with champions to address any barriers
- Continue educational sessions and inservices regarding implementation
- Implement the use of the Apfel Risk Assessment Score, specifically motion sickness
- Gather data and begin interpreting results with a statistician
- Complete interpretation of results

### April 2020

- Meet with champions and manager to addresses changes/revisions for future practice
- Present findings/results to hospital administration