Development and Evaluation of a Nurse Anesthetist-Directed Postoperative Nausea and Vomiting Protocol in a Community Medical Center

An Evidence-Based Scholarly Project

Submitted to the College of Health Professions

in Partial Fulfillment of the

Requirements for the Degree

Doctor of Nursing Practice

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November 2021

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Title: Development and Evaluation of a Nurse Anesthetist-Directed Postoperative Nausea and Vomiting Protocol in a Community Medical Center

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Postoperative nausea and vomiting (PONV) is a frequent complication encountered by patients after surgery in the post anesthesia care unit (PACU). It is distressing, rated worse than pain, and a feared component of the surgical experience. Additionally, PONV is associated with delayed recovery, unexpected hospital admission, pulmonary aspiration, wound dehiscence, and dehydration. In consideration of patients' comfort and satisfaction, it is important to identify who is at risk for PONV and preemptively address this complication to the greatest extent possible. Adopting the recommendations from the Society of Ambulatory Anesthesia (SAMBA) which include the Apfel Simplified Risk Score (ASRS) and multimodal pharmacological intervention (MPI) is imperative to evaluate predisposing factors for PONV and identifying surgical patients who may benefit from prophylactic antiemetic medication early. The implementation of the ASRS and MPI are cost-effective strategic methods for PONV patients undergoing general anesthesia. Data will be collected, recorded, and analyzed to enhance quality care, patient outcomes, and patient satisfaction, yielding a reduction in the incidence of PONV while further reducing the length in PACU stay and creating a standardization of anesthetic practice. The results determined that PONV was not eliminated but rather reduced as there were minimal interventions with the PACU stay; 68.5% patients with an APFEL score of 2 and 3 who were treated with MPI based on management experienced no postoperative nausea or postoperative vomiting in the PACU, yielding a clinical

significance. In addition, the SAMBA recommendations showed a 15-minute improvement in PACU LOS when comparing pre-implementation data to post-implementation data.

Keywords: PONV, Apfel Simplified Risk Score, multimodal, prevention, general anesthesia

ACKNOWLEDGMENTS

Thank you, Wilmington University faculty, for your dedication and service to educating nurses. Also, my sincere thank you goes to DNP Chairman Dr. Aaron Sebach, DNP Project Chairman Dr. Charles Dolan, and Dr. Joanne Fletcher. The project was completed with the full support and guidance from St. Mary's General Hospital Anesthesia Chairman, Dr. Randy Cohen and Project Team Member, Dr. Marc Russo. I am truly appreciative of the perioperative department especially the staff, surgeons, registered nurses, and anesthesia providers. Thank you, Statistician, Dr. B. Kyle Johnson and Henry Kuzin, Operating Room Manager for aiding in acquiring and examining the baseline data. I want to thank my husband, Mr. Maxwell K. Acquah for his support, assistance, love, and patience, as I charted life during my DNP journey. Finally, I would like to also acknowledge Mr. Simon Marfo and Mrs. Doris Marfo (my parents) and George and Jessica Marfo (siblings) who pushed me to acquire the highest level of education in my profession as well as constantly re-reading all my work during this journey. Thank you all!

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ABBREVIATIONS

APN	Advanced Practice Nurse
ASRS	Apfel Simplified Risk Score
DNP	Doctor of Nursing Practice
EBP	Evidence Based Practice
EMR	Electronic Medical Record
JHEBP	Johns Hopkins Nursing Evidence-Based Practice Model
LCT	Kurt Lewin Change Theory
MPI	Multimodal Pharmacological Intervention
PACU	Post Anesthesia Care Unit
PDSA	Plan-Do-Study-Act
PICOT	Population, Intervention, Comparison, Outcome, and Time
PONV	Postoperative Nausea and Vomiting
QI	Quality Improvement
SAMBA	Society of Ambulatory Anesthesia

CHAPTER ONE

INTRODUCTION

Approximately 75 million people, or one-third of surgical patients in the United States experience postoperative nausea and/or vomiting (PONV; Gan et al., 2014). PONV is classified as nausea, vomiting, or retching within 24 hours of receiving general anesthesia during the postoperative period or discharge (Feinleib et al., 2020; Gan et al., 2014; Jin et al., 2020). This complication occurs in two parts: vomiting and retching. Vomiting occurs when the vomiting reflex is stimulated by the glossopharyngeal, hypoglossal, and vagal nerves approaching the vomiting center (Chatterjee et al., 2011). Subsequently, retching is the systematic contraction of the respiratory muscles such as the diaphragm, abdominal wall muscles, and chest wall without the actual discharge of gastric content (Chatterjee et al., 2011). PONV is distressing, rated worse than pain, and a feared component of many surgical patients (Jin et al., 2020). Additionally, studies have shown, some patients are willing to pay as much as $100 out of pocket to avoid PONV (Dzwonczyk et al., 2012; Feinleib et al., 2020; Parra-Sanchez et al., 2012). This demonstrates patients enacting measures to avoid PONV, even if they have limited means to do so. Patients should not have to suffer in silence when it comes to PONV; therefore, early detection of the potential for PONV should be conducted during the preoperative intake.

PONV is a factor of quality care and patient satisfaction, which are significant components affecting organizational reimbursement (Gan et al., 2020; Nagelhout, 2018). PONV can be costly to an institution, as patients often stay in the post-anesthesia care unit (PACU) for an extended length of time, ultimately delaying the flow of continued

service (Ganter et al., 2014; Partridge et al., 2016). Per Parra-Sanchez et al. (2012) the incremental cost of $75 per episode of nausea and vomiting affects the hourly cost of PACU care. An episode of vomiting can delay a patient's PACU stay by approximately 25 minutes, thereby impacting patient flow (AlJabari et al., 2016). Patient flow may appear to be a trivial concern against issues such as patient safety, but is a contributor to other challenges for PACU care (Chatterjee et al., 2011). A reported $1.5 million loss in revenue is associated with PONV along with discharge delays (Masiongale et al., 2018). To combat this loss of revenue, the literature suggests the benefits of administering antiemetics or agents that prevent and treat stimulation of the vomiting center of the brain in at-risk patients for PONV which could overshadow any risks associated with cost, side effects of anesthesia, untoward events, and deviations from safe and effective care (Gan et al., 2014, 2020; Jin et al., 2020; Masiongale et al., 2018). The need for an accurate and standardized risk assessment based on clinical and indicators of PONV warrants the implementation of a management algorithm in the perioperative area for improved patient outcomes, quality improvement, and management (Dewinte et al., 2018). The purpose of this project was to create standard practices among anesthesia providers that yielded consistency as well as delivered high-quality, cost-effective care to patients to decrease the incidence of PONV in the PACU.

Problem Description

PONV is a common complication that continues to play a significant role in the field of anesthesia. Apart from uncommon deleterious sequela of aspiration and wound dehiscence from PONV, it may not be considered life-threatening compared to other anesthesia complications, PONV is remarked to be dissatisfying, and considered more

bothersome than pain (Feinleib et al., 2020; Gan et al., 2014; Ganter et al., 2014). In spite of advances in pharmacological therapy, the development of vomiting affects roughly 30% of patients, the incidence of nausea affects approximately 50% of patients, and in certain high-risk populations, the rate of PONV is 80% (Gan et al., 2014).

Unfortunately, left untreated, PONV can lead to complications such as esophageal rupture, dehydration, aspiration, electrolyte imbalance, wound dehiscence, pneumothorax, increased intracranial pressure, and a decrease in overall quality of care or life (Feinleib et al., 2020). Utilizing risk stratification to guide prophylactic antiemetic administration has shown to significantly reduce PONV (Feinleib et al., 2020; Gan et al., 2014; Jin et al., 2020). It is critical to identify at-risk patients early and treat PONV in a timely manner, to prevent increasing the nurse-to-patient ratio and increasing safety risks, extending patient length of stay (LOS), disrupting department throughput of patients, and a reduction of revenue and reimbursement if other cases are cancelled due to lack of available beds for incoming surgical patients (Gan et al., 2014; Smith & Ruth-Sahd, 2016). Unintended hospital and readmissions further increase health care costs due to the increased need and use of resources, increase of nursing care delivery with added time and expenditures, increased cost of new and additional medications to treat the affected patient (Gan et al., 2020).

Risk factor assessments for PONV are found not to be routinely performed, regulated, or mandated. Consequently, patients with a history of PONV who voluntarily disclose this information during the preoperative phase are administered antiemetics intraoperatively by the preferences of anesthesia providers. This ultimately, leads to variable outcomes for all surgical patients as a whole, leaving many at-risk patients for

PONV to be susceptible to PONV experiences. Additionally, the method and order of antiemetic administration is often left to anesthesia providers' preferences and Which further enables variable PONV outcomes for surgical patients. Although guidelines exist in the treatment and prevention of PONV, which are supported by research, many providers fail to implement or properly adhere to these proven and standardized guidelines (Gan et al., 2014; Feinleib et al., 2020; Masiongale, 2018). As per proper identification of patients who are at risk, keeping the baseline risk low, and proactively administering prophylactic antiemetics to low-and high-risk patients will allow providers to diminish the potential of harm in the PACU experience (Gan et al., 2014). Because of the outlined implications and consequences of PONV above, providers should consider PONV prophylaxis as an essential part of high-quality care, just as important as providing sufficient pain relief (Dewinte et al., 2018; Gan et al., 2020).

To decrease the incidence of PONV in the PACU, the first objective is to devise standard practices among anesthesia providers that yield consistency and deliver high-quality, cost-effective care to patients. One important way to combat the incidence of PONV is to adopt the consensus guidelines recommended by the Society of Ambulatory Anesthesia (SAMBA; Gan et al., 2020). These guidelines endorse a formal scoring scale to identify patients and also provide recommendations for prophylactic antiemetic treatment through two or more multimodal PONV reduction approaches (Gan et al., 2014; Gan et al., 2020).

The second objective is to consult with the information technology (IT) department to build a PONV risk stratification assessment tool known as the Apfel Scoring Risk Scale (ASRS) into the electronic medical record (EMR) for use during

perioperative intake. The ASRS is a crucial, clinical risk assessment score, which is utilized to identify patients with high risk for PONV (Apfel et al., 1991; Gan et al., 2014). The ASRS identifies four independent risk factors for PONV. These risk factors are shown in Table 1 along with the points assigned to each factor for a sum of 4 points (Apfel et al., 1991; Feinleib et al., 2020; Gan et al., 2014).

Table 1

Apfel Independent Risk Factors for PONV

Risk Factors	Points
Female Gender	1
History of PONV or MS	1
Non-Smoker	1
Postoperative Opioids	1
Sum	**0–4**

Note. Adapted from "Consensus guidelines for the management of postoperative nausea and vomiting," by T. J. Gan, P. Diemunsch, A. S. Habib, A. Kovac, P. Kranke, T. A. Meyer, M. Watcha, F. Chung, S. Angus, C. Apfel, S. D. Bergese, K. A. Candiotti, M. T. V. Chan, P. J. Davis, V. D. Hooper, S. Lagoo-Deenadavalan, P. Myles, G. Nezat, B. K. Philip, & M. R. Tramèr, 2014, *Anesthesia & Analgesia, 118*(1), p. 87 (https://doi.org/10.1213/ANE.0000000000000002. Copyright 2014 by International Anesthesia Research Society.

Each factor generates a 1-point score which leads to the proper treatment algorithm. Score range from 0–4, implying that risk increases to 20%, 40%, 60%, and 80% for each additional factor. No risk equates to 10% (Apfel et al., 1991; Gan et al., 2014). The scores generate an antiemetics algorithm based on low-, medium-, and high-risk, coupled with collaboration with the pharmacy department to account for drug cost. Based on the recommendations of SAMBA, combination therapy has a greater effect than monotherapy due to varied mechanisms of action on different receptors that optimize the efficacy of relief (Gan et al., 2014; Gan et al., 2020; Maitra et al., 2016).

The strategic methods for reducing PONV at an institution can only be accomplished by early identification of PONV -susceptible patients and preemptively administering a prophylactic antiemetic regimen. The new standard will facilitate a more pleasant perioperative experience, reassure confidence in the anesthesia process, and assure the surgical institution that anesthesia providers are competently administering patient-centered, high-quality, and cost-effective care for PONV-susceptible patients, as well as all patients collectively.

Rationale

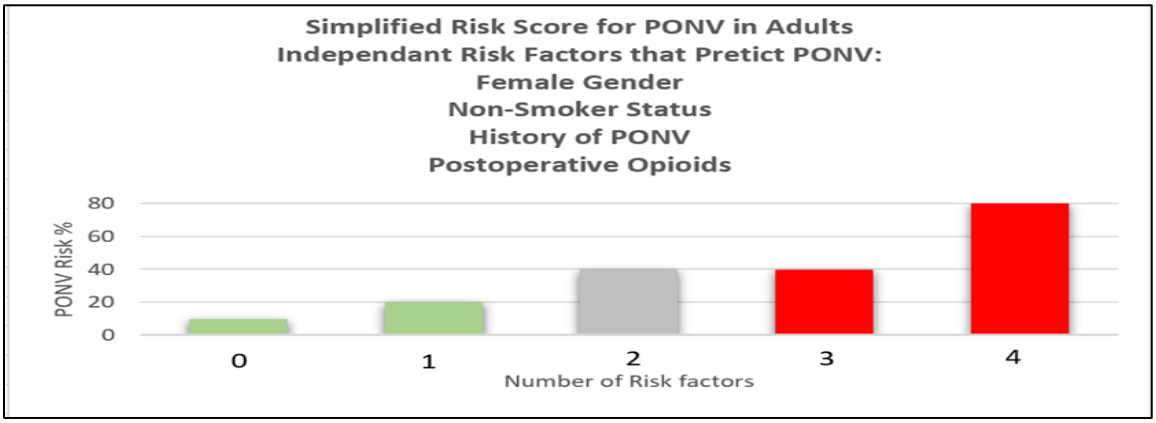
According to Gan et al. (2014), SAMBA first issued consensus guidelines for PONV in 2007 and revised them in 2014. The guidelines recommended the use of ASRS to create a cohesive treatment protocol for the management of PONV. The literature demonstrates the ASRS tool reduces PONV incidence and promotes efficacious outcomes post-antiemetic interventions for PONV (Apfel et al., 1991; Gan et al., 2014; Jin et al., 2020; Maitra et al., 2016; Som et al., 2016). The assessment tool was tested for validity and reliability in identifying high risk for PONV. The tool also aids in the process of effectual PONV management (Apfel et al., 1991; Feinleib et al., 2020; Gan et al., 2014; Sherif et al., 2015). The ASRS tool assures patients are appropriately and systematically assessed while concurrently circumventing unnecessary and underutilized antiemetic agent prescription. The ASRS tool identifies independent factors such age, female gender, nonsmokers, history of PONV, motion sickness, and postoperative opioids administration (Figure 1; Apfel et al., 1991; Gan et al., 2014; Sherif et al., 2015). Each factor is linked to a 20% increased risk of incidence while an overall score of 4

yields an 80% increased risk for PONV (Gan et al., 2014; Jin et al., 2020; Sherif et al., 2015.

SAMBA's panel of professionals further recommended that combined therapy with two or more multimodal pharmacological interventions (MPI) is useful in patients at high risk for PONV (Gan et al., 2014). The goals of this integrative regimen should mirror those of the previously mentioned ASRS guidelines by ensuring providers understand who is at risk; establish factors that reduce PONV baseline risk; determine effective single-drug and multimodal antiemetic therapy to include pharmacological and non-pharmacological approaches; ascertain best strategy to treat PONV; determine suitable drug dosing and timing of PONV prophylaxis; evaluate the cost-effectiveness of PONV treatment regimens; and create an algorithm to identify PONV-susceptible patients with devised correlational treatment recommendations (Gan et al., 2014).

Figure 1

Adaption of the Simplified Apfel Scoring System



Note. Simplified risk score predicts adult patient's risk for PONV for in adults when 0, 1, 2, 3, and 4 of the risk factors are present, the corresponding risk for PONV is about 10%, 20%, 40%, 60%, and 80%, respectively. Adapted from "Consensus guidelines for the management of postoperative nausea and vomiting," by T. J. Gan, P. Diemunsch, A. S. Habib, A. Kovac, P. Kranke, T. A. Meyer, M. Watcha, F. Chung, S. Angus, C. Apfel, S. D. Bergese, K. A. Candiotti, M. T. V. Chan, P. J. Davis, V. D. Hooper, S. Lagoo-Deenadavalan, P. Myles, G. Nezat, B. K. Philip, & M. R. Tramèr, 2014, *Anesthesia & Analgesia,*

118(1), p. 87 (https://doi.org/10.1213/ANE.0000000000000002). Copyright 2014 by International Anesthesia Research Society.

The algorithm places patients into a low-, medium-, or high-risk antiemetics group. Patients who are low-risk have scores from 0 to 1 and typically receive no or one medication. Medium-risk patients score 2 to 3 on the ASRS and are prescribed one or two medications from the different drug classes. A score greater than or equal to 3 places a patient in the high-risk category where two or more medications are prescribed (Gan et al., 2014; Jin et al., 2020) The algorithm is shown in Table 2.

Table 2

Adaption of SAMBA PONV Adult Prevention Algorithm

Risk Score	Risk of PONV	Risk Factors	Risk Level	Guidelines
0	10%	0–1	LOW	None or **1** antiemetic agent (Ondansetron or Dexamethasone)
1	20%	Factors		
2	40%	1–2	MEDIUM	**2** antiemetic agents (Ondansetron, Dexamethasone, Famotidine, or TIVA)
3	60%	Factors		
4 or more	80%	>2 Factors	HIGH	**3–4** antiemetic prophylaxis (Ondansetron, Dexamethasone, Diphenhydramine, Scopolamine Patch, Famotidine, TIVA, or Metoclopramide)

Note. Adapted from "Consensus guidelines for the management of postoperative nausea and vomiting," by T. J. Gan, P. Diemunsch, A. S. Habib, A. Kovac, P. Kranke, T. A. Meyer, M. Watcha, F. Chung, S. Angus, C. Apfel, S. D. Bergese, K. A. Candiotti, M. T. V. Chan, P. J. Davis, V. D. Hooper, S. Lagoo-Deenadavalan, P. Myles, G. Nezat, B. K. Philip, & M. R. Tramèr, 2014, *Anesthesia & Analgesia, 118*(1), 85–113 (https://doi.org/10.1213/ANE.0000000000000002. Copyright 2014 by International Anesthesia Research Society.

In concert with developing the ASRS and SAMBA MPIs, a theoretical framework should be adopted to enhance and promote quality care. Nursing theorist Kurt Lewin developed the Lewin Change Theory (LCT) in 1951 (Current Nursing, 2020). The LCT explains forces that influences change in people and the stages which are essential for change to be completely successful. LCT suggests an analysis of "driving and restraining

forces” that must be acknowledged and addressed before any implementation of change can occur (Current Nursing, 2020). Lewin’s model consists of three components with the following titles designating each stage of the process: “unfreeze, change, and refreeze". The three components must be experienced to stimulate an ideal and long-lasting level of change (Connelly, 2020).

The LCT was purposefully selected to guide the implementation of ASRS and MPI for PONV prevention and treatment. To reiterate, there are three stages to this theory to “unfreeze,” “change,” and “refreeze” perceptions and behaviors to employ and optimize change. During the *unfreezing* phase, dated and previously established perceptions about the importance of PONV were carefully examined with staff. The acknowledgment of possible, apparent, and future stigmas hindering quality care is essential to allow acceptance a new PONV protocol and all aspects concerning its implementation. Communication is of high priority within this stage and will allow for the disruption of stigmas concerning PONV. The evidence behind PONV would be explored and having empathy for patients suffering from PONV would be discussed. The more providers know about the change to come, the more they can feel an urgency and empowerment to accept the change. From this premise, one can conceptualize that tapping into the emotional, intellectual, and motivational aspects of providers while giving them the opportunities for learned change can impact care in a positive trajectory for solidified change (Connelly, 2020).

The “*change”* phase refers to transitioning into a new state (Connelly, 2020). In this project, which is the purpose for this manuscript, the “change” phase was the actualized implementation of the protocol. This implementation included all aspects

surrounding and within the executed ASRS and MPI protocol involving provider perceptions, behavior, and documentation. Implementation would entail having providers work together to develop the algorithm guided by evidence-based research for treatment. Providers would perform mock trials of a preoperative intake assessing PONV, providers would be educated on the ASRS, and providers would implement the use of MPI based on score level. Education, communication, and support was critical and needed at this phase for providers to be acquainted with the changes to combat PONV. Most importantly, providers would be reminded of the reasons for change and how the change will benefit patient outcomes and quality care. As a result of the change initiative, clinicians would acquire new behaviors, forms of thinking, and new ways of dispensing information.

Refreezing was the final step in change theory and relates to reinforcing and solidifying the newly developed change-state (Connelly, 2020). The use of the PONV ASRS and MPI template was integrated appropriately into provider workflow, would improve proficiency in PONV prophylaxis and efficacy in patient care. Through a sense of urgency and a strong vision, these strategic methods would become accepted and part of the new norm during preoperative intake and medication essentially improving patient outcomes and quality of care (Bloomstone, 2016). Examining whether early identification of PONV-prone patients and administering proper medication treatment help reduce PACU LOS and patient outcomes would positively exemplify the essence of the DNP project.

The primary investigator would use the conceptual framework Plan-Do-Study-Act (PDSA) as a road map to assess, diagnose, implement and evaluate the project to further

promote change theory. The framework will be used to guide the implementation of the PONV protocol with the strategic method of utilizing the ASRS to identify potential and high-risk patients early, resulting in intentional and swift action. The PDSA model is the pillar of any quality improvement implementation (Portela et al., 2015). This framework starts with observing and analyzing the root cause of a problem (Silver et al., 2016); and for concepts conveyed of this project, the root cause of the problem identified was that patients are not assessed properly during the preoperative intake, and adherence to PONV treatment regimen is problematic (Dewinte et al., 2018). Therefore, the aim of this DNP project is to see a significant reduction in the incidence of PONV and better compliance with the treatment regimen using an ASRS and MPI protocol at the selected institution (Dewinte et al., 2018).

A key feature of the PDSA model involves collecting and comparing data related to current practices of the perioperative domain along with evaluating complaints from patients and nurses in the PACU. Apart from this standpoint, having knowledge of ASRS is not sufficient for providers; ASRS should be integrated into routine clinical practice in order to evade dated and ineffective practices as well as assuage patient and nurse complaints. Adopting ASRS for early identification during the perioperative process is vital. Furthermore, the utilization of change theory and the PDSA framework will comply with the purpose of this writer's DNP project by assimilating scientific underpinnings that enhance the translation of research into clinical practice and direct the clinical injury question, thereby helping patients experience greater satisfaction through high-quality care.

Specific Aims

The clinical problem of improper identification of PONV and the execution of a comprehensive treatment plan as the main focus of this quality improvement project. To solve the problem presented, a well-formulated question is needed to guide the clinical inquiry. Thus, the PICOT question generated is: *In adults undergoing outpatient surgery receiving general anesthesia, how does the implementation of the ASRS assessment and SAMBA treatment protocol when compared to current practice affect incidence of PONV and PACU length of stay over a 3-month period?*

Population (P): Outpatient adults undergoing general anesthesia

Intervention (I): ASRS assessment and SAMBA treatment protocol

Compared (C): Current practice

Outcome (O): Incidence of PONV and PACU length of stay

Time (T): 3 months

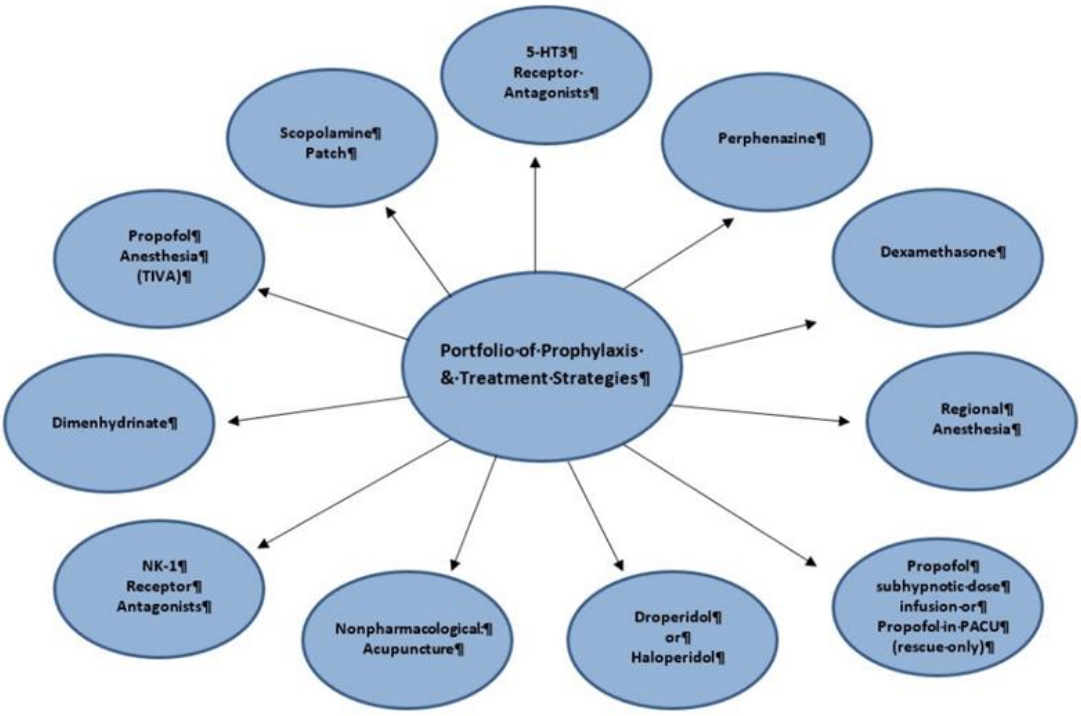
To decrease the incidence of PONV in the PACU, the main objective is to create standard practices among anesthesia providers that yield consistency and deliver high-quality, cost-effective care to patients. This objective will be achieved by early identification of PONV -prone patients and administering a prophylactic antiemetic regimen that reflects the recommendations from SAMBA.

Early identification of PONV occurs when the ASRS is adopted and utilized to create a risk stratification tool. The portfolio of antiemetics created by SAMBA further aids the practitioner in addressing and reducing PONV (Gan et al., 2014). The antiemetic portfolio is categorized into first line, second line, and third line interventions, which are essential in creating MPI. Medications such as ondansetron, palonosetron,

dexamethasone, and aprepitant are the most effective treatments in first line defense interventions (Gan et al., 2014, 2020). Second line defense drug interventions are less effective but are worthy to have available in the drug toolbox and include scopolamine patch, diphenhydramine, detoclopramide, droperidol, and promethazine (Gan et al., 2014; Maitra et al., 2016). Finally, third line defense interventions include Propofol, hydration, anti-inflammatories, and aromatherapy, which are ineffective alone but best used as adjuncts to first- and second-line treatments (Gan et al., 2014, 2020). The SAMBA antiemetic portfolio is depicted in Figure 2.

Figure 2

SAMBA Antiemetic Portfolio



Note. Adapted from "Consensus Guidelines for the Management of Postoperative Nausea and Vomiting," by T. J. Gan, P. Diemunsch, A. S. Habib, A. Kovac, P. Kranke, T. A. Meyer, M. Watcha, F. Chung, S. Angus, C. Apfel, S. D. Bergese, K. Candiotti, M. T. V. Chan, P. J. Davis, V. D. Hooper, S. Lagoo-Deenadayalan, P. Myles, G. Nezat, B. K. Philip, and M. R. Tramèr, 2014, *Anesthesia & Analgesia, 118*(1), p. 91 (https://doi.org/10.1213/ANE.0000000000000002). Copyright 2014 by International Anesthesia Research Society.

Gan et al. (2014) provided the onset and timing of MPI-based on extensive studies within the literature. MPI would be tailored to the patient's individual risk level based on the ASRS to improve care and patient outcomes during the perioperative period. Utilizing evidence-based practice (EBP) to spearhead this quality improvement project would theoretically reduce the number of patients who develop PONV by identifying the candidates early and adopting an effective multimodal drug treatment. SAMBA's timing recommendations are displayed in Table 3.

Table 3

SAMBA's Antiemetic Doses and Timing Recommendations

DRUG	DOSE	TIMING
Aprepitant	40mg PO	Before induction
Dexamethasone	4–5mg IV	At induction
Dimenhydrinate	1mg/kg IV	At induction
Droperidol	0.625–1.25mg IV	End of surgery
Ephedrine	0.5mg/kg IM	End of surgery
Haloperidol	0.5–<2mg IM/IV	End of surgery
Methylprednisolone	40mg IV	No clear data available
Ondansetron	4mg IV or 8mg ODT	End of surgery
Palonosetron	0.075mg IV	At induction
Promethazine	6.25–12.5mg IV	End of surgery
Scopolamine	Transdermal Patch	Prior evening or 2hrs before surgery

Note. Adapted from "Consensus Guidelines for the Management of Postoperative Nausea and Vomiting," by T. J. Gan, P. Diemunsch, A. S. Habib, A. Kovac, P. Kranke, T. A. Meyer, M. Watcha, F. Chung, S. Angus, C. Apfel, S. D. Bergese, K. Candiotti, M. T. V. Chan, P. J. Davis, V. D. Hooper, S. Lagoo-Deenadayalan, P. Myles, G. Nezat, B. K. Philip, and M. R. Tramèr, 2014, Anesthesia & Analgesia, 118(1), p. 91 (https://doi.org/10.1213/ANE.0000000000000002). Copyright 2013 by International Anesthesia Research Society.

The identification of patients who are at risk will allow providers to diminish the potential of harm by keeping baseline risk low and proactively administrating prophylactics antiemetic to low- and high-risk patients (Gan et al., 2014). The new standard would facilitate a more pleasant preoperative experience, instill confidence in

the anesthesia process, and assure the institution that providers are doing everything possible to administer quality and safe anesthesia for PONV-susceptible patients. This DNP project's overall result woold satisfy the DNP Essentials outlined by the American Association of Colleges of Nursing (2006) through the process of properly identifying patient risk factors during the perioperative intake and allow for adequate PONV coverage.

Definition of Terms

Postoperative Nausea and Vomiting

PONV is characterized as nausea, vomiting, or retching during the postoperative period or discharge within 24 hours after general anesthesia (Feinleib et al., 2020; Jin et al., 2020). The components of PONV, nausea and vomiting, are two different physiologic responses. Nausea is described as an unpleasant sensation associated with the urge to vomit whereas vomiting is the physical and forceful discharge of gastric contents from the oral cavity triggered by the vomiting reflex (Chatterjee et al., 2011). Cerebrospinal fluid interacts with the chemoreceptor trigger zone located in the floor of the fourth ventricle to ultimately induce the experience of nausea and/or vomiting. This interaction stimulates neurotransmitters and receptors such as histamine, serotonin, muscarinic M1, neurokinin-1, cholinergic, and D2 dopamine receptors indirectly along with the stimulation of the vagus nerve endings in the gastric system, playing a role in the development of PONV (Chatterjee et al., 2011; Feinleib et al., 2020).

Summary

Chapter One contained an introduction to PONV's relevance and direct impact on quality of care and patient outcomes. PONV is classified as nausea, vomiting, or retching

within 24 hours after receiving general anesthesia. PONV-prone patients are not often properly identified and managed. This problem is relevant to key stakeholders at surgical facilities, especially at a time in history where healthcare is graded and reimbursed based on satisfaction and outcome metrics. Experiences of PONV and the lack of preemptive treatment of it, lead to extended PACU stays, prolonged hospital stays if the patient is admitted to the unit, increased costs, and likely unsatisfactory survey reviews for the institution (Gan et al., 2014; Teunkens et al., 2017). As such, this evidence-based DNP project was aimed at creating a strategic method for early identification of PONV-susceptible patients utilizing ASRS and MPI methodologies which would lead to a reduction in the incidence of PONV and reduced PACU length of stay, yielding a salutary solution for this complication.

Combination therapy is of greater value than single therapy as per SAMBA, these recommendations (see Appendix A) indicate there are different mechanisms of action on receptors that optimize the efficacy of PONV relief (Gan et al., 2014, 2020; Jin et al., 2020). By identifying patients at risk for PONV, keeping the baseline risk low, and proactively administering prophylactic antiemetics to low- and high-risk patients, providers will diminish the potential of harm from the untoward effects of delivered anesthetics (Gan et al., 2014). Adherence to the strategic methods will require the usage of the LCT framework, which involves unfreezing, changing, and refreezing to stimulate change within the department. Integrating the ASRS modality into the preoperative process as a common daily clinical practice, adherence should be an easily implemented task. Positive outcomes related to the implementation of the new protocol will include a more pleasant patient experience and enhanced quality of care. In Chapter Two, a

thorough analysis and synopsis of the literature related to PONV and its treatment will be explored.

CHAPTER TWO

LITERATURE REVIEW

Search Strategy

Examining strategies for PONV such as the impact of utilizing the ASRS and MPI frameworks on the incidences of PACU length of stay required performing an extensive and comprehensive electronic database search. Key search words directly related to the PICOT question were selected such as PONV, multimodal, PACU stay/length, SAMBA, general anesthesia, prophylactic treatment, ASRS, prevention, and antiemetics. Studies and phrases in the English language that did not contribute to the PICOT question were further excluded. PubMed (which includes MEDLINE and National Library of Medicine) with Full Text, Google Scholar, Crochane Database of Systematic Review, and Cumulative Index to Nursing and Allied Health Literature (CINAHL) were employed to extract 3,450 articles from the years 2011–2020. Non-duplicate citations (n = 1,500) were screened; 500 articles were excluded after title/abstract screening, and 1,000 articles were retrieved. From those 1,000 articles, 500 articles were excluded after full-text screening; 467 articles were excluded during the extraction of data, yielding a total of 33 relevant articles that met inclusion criteria to answer the PICOT question (see Appendix B), concentrating on consistent, high quality, patient-focused, clinical evidence that was translatable in the English language based on the guidance of Johns Hopkins Nursing Evidence-Based Practice Model (JHEBP).

EBP Model

The JHEBP was critical in securing articles that impacted the PICOT question. The JHEBP model is known for depicting a strategic problem-solving roadmap for

generating evidence-based change by organizing, planning, implementing, and evaluating the process into clinical practice (Melnyk & Fineout-Overholt, 2019). The JHEBP is comprised of three phases: (a) practice question, (b) evidence review, and (c) research findings translated into practice (Melnyk & Fineout-Overholt, 2019). In this model, quantitative and qualitative EBP literature was appraised and categorized in levels I, II, III, IV, and V, which aids in the reinforcement of strategic methods such as the usage of ASRS and MPI modalities to manage PONV in the clinical setting to improve patient outcomes and quality care. Level I is comprised of systematic reviews and meta-analyses of randomized controlled trials (RCT). Level II articles are combinations of RCT, quasi-experimental, and quantitative studies while Level III contains non-experimental studies, quasi-experimental studies or controlled trials lacking randomization, and studies that are qualitative in nature. Level IV articles include expert opinions and consensus panels while Level V articles are characterized as case reports, quality improvement, program evaluation and financial evaluations.

The JHEBP model dovetailed with the aim, purpose, and implementation of this writer's DNP project provided the foundational literature that primarily guided to construct the project. The DNP project is a reflection of the JHEBP model for promoting actions to improve patient outcomes and the application of high-quality evidence (Dang & Dearholt, 2018). Implementing the JHEBP model enhances patient outcomes and promotes providers' knowledge by allowing them to stay current regarding medications and therapies for PONV. Research and anecdotal evidence show providers unintentionally perform a "*one treatment fits all"* mindset for PONV (Kranke, 2015); using the JHEBP would allow this problem to be mitigated and prevented while granting

a standardized prophylactic intervention to be developed. Most importantly, the JHEBP model supports the notion that the identification of patients at risk for PONV by utilizing the ASRS and providing MPI frameworks is embedded in EBP and not providers' preferences or experiences, further promoting positive patient outcomes.

Available Knowledge

A literature review was crucial to answer the question PICOT question: *In adults undergoing outpatient surgery receiving general anesthesia, how does the implementation of the ASRS assessment and SAMBA treatment protocol when compared to current practice affect incidence of PONV and PACU length of stay over a 3-month period?* The highest quality of evidence supporting the clinical inquiry came from the consensus guidelines for PONV created by SAMBA, which improve patient outcomes through idealized care delivery care (Gan et al., 2014, 2020). Two Level IV articles (Gan et al., 2014, 2020) aided this writer in the knowledge and proper management of PONV. The literature review demonstrated other studies often referenced this article. Gan et al. (2020) support the notion that *nil per os* (NPO; nothing by mouth) after midnight may increase the risk of PONV. Furthermore, each episode of emesis delays discharge from the PACU by approximately 25 minutes (Gan et al., 2014).

Unresolved PONV may result in prolonged PACU stay and unanticipated hospital admission that results in a significant increase in overall health care costs (Gan et al., 2014). PONV risk scores have been shown to reduce the rate of PONV at an institutional level and can be used to inform and guide therapy (Gan et al., 2020). PONV always happens postop, treatment should be administered with an antiemetic from a pharmacologic class that is different from the prophylactic drug, if a prophylactic

medication was previously given. If no prophylaxis was given, the recommended treatment is a low-dose 5-HT3 antagonist (Gan et al., 2020). Measures must be put in place to determine whether suggested algorithms for the management of PONV are employed as standard operating procedure in clinical settings and if these practices lead to improvement of PONV management (Gan et al., 2014). Not all surgical patients will benefit from antiemetic prophylaxis; thus, identification of patients at increased risk using available risk scores leads to the most accurate and patient-centered use of therapy, leading to greater attainment of revenue and decreased incidents of cost accruement (Gan et al., 2014).

Reducing baseline risk for PONV includes: minimization of perioperative opioids utilizing, multimodal analgesic regimens, preferential use of regional anesthesia, preferential use of propofol infusions as the primary anesthetic, avoidance of volatile anesthetics, and adequate hydration (Gan et al., 2014). Most importantly, SAMBA suggests a risk-adapted PONV protocol to effectively reduce PONV incidence (Figure 3; Gan et al., 2014).

Figure 3

SAMBA Strategies to Reduce Baseline Risk

- Avoidance of general anesthesia by the use of regional anesthesia
- Use of propofol for induction and maintenance of anesthesia
- Avoidance of nitrous oxide
- Avoidance of volatile anesthetics
- Minimization of intraoperative and postoperative opioids
- Adequate hydration

Note. Adapted from "Consensus guidelines for the management of postoperative nausea and vomiting," by T. J. Gan, P. Diemunsch, A. S. Habib, A. Kovac, P. Kranke, T. A. Meyer, M. Watcha, F. Chung, S. Angus,

The Level I literature review yielded eight good-quality articles directly answering the PICOT question. These articles focused on the MPI method for PONV. Findings from Bataille et al. (2016) suggested that PONV in the first 24 hours occurred in 45% of patients who received prophylaxis and 54% in a placebo group. In contrast, Lee et al. (2015) found a significant decrease in the number of rescue antiemetics administered in the first 6 hours postoperatively when reviewing the medication administration record. Dabu-Bondoc et al.'s (2013) findings implied that administration of IV dextrose post-anesthesia resulted in improved PONV management evidenced by reducing rescue antiemetic medication needs and PACU length of stay. Results from that study further implied that patients who received Dextrose 5% in Ringer's lactate solution required less rescue antiemetic medications, ratio mean difference 0.56, 95% CI [0.39–0.82], $p = .02$, and had a shorter length of stay in the PACU, ratio mean difference 0.80, 95% CI [0.66–0.97], $p = .03$ (Dabu-Bondoc et al., 2013). Nordin et al. (2016) and Bataille et al. (2016) supported that 5-HT3 antagonists, particularly "ondansetron are effective drugs to treat PONV, as well as being just as effective as dexamethasone, or working synergistically in conjunction with dexamethasone in preventing PONV.

Zhou et al. (2016) found that during the early postoperative period (0–6 hours), 5-HT 3antagonists were significantly superior to dexamethasone in reducing PONV, (risk ratio 0.31, 95% CI [0.11,0.93], $p = .04$). In contrast, Bataille et al. (2016) found the incidence of PONV at 4–6 hours were significantly lower when dexamethasone was used instead of ondansetron (odds ratio [OR] 0.49, 95% CI [0.24, 0.98] $p = .04$). According to

the literature, combination therapy is of greater importance. Sayed et al. (2016) revealed that PONV was significantly lower, $p > .001$ in the combination therapy group (25% and 30%) compared with the dexamethasone group (35% and 30%) and super-hydration group (32.5% and 35%). In a final study, Ashok et al. (2017) placed patients in two controlled groups: liberal and restrictive. Findings revealed PONV was significantly lower in the liberal group while vomiting was high among patients who did not receive treatment (restrictive group). From this premise and verification of evidence, the Level I evidence in the literature supported the need for MPI model utilization to direct providers in preventative care.

Level II literature analysis yielded two appropriate and correlational articles supporting the MPI method portion of the PICOT question. Masiongale et al. (2018) purported a remarkable beneficial effect associated with the combination of two medications across all risk levels. For example, when a combination of metoclopramide and ondansetron was administered, the observed incidence of PONV was 16% statistically significant, $p < .001$. Additionally, risk-dependent prophylaxis decreased the incidence of PONV (Kappen et al., 2015). In a study conducted by Kappen et al. (2015) the use of risk-tailored intervention compared with care-as-usual was effective with prophylactic antiemetic administration when the approach is directive. There is an overall reduction in PONV, OR 60, 95% CI [0.43, 0.83], with an even greater reduction in PONV in high-risk patients, OR 0.45, 95% CI [0.28, 0.72]. Level II articles support patient-tailored MPI execution that yielded a positive outcome in preventing PONV.

Twelve sound and relevant Level III articles were found in support of the two components of the clinical inquiry question. To reiterate, the first component involves the

effects of PONV on PACU. Some researchers (Bamgbade et al., 2018; Parra-Sanchez et al., 2012) found that patients with PONV spent one hour longer in the PACU than patients without PONV. Myles and Wengritzky (2012) also found that patients with severe-degree PONV had a poorer quality in recovery, $p < 0.0005$, required additional antiemetic administrations, $p < .0005$, and were likely to have consequences and complications when compared with those with lesser degrees of PONV. Parra-Sanchez et al. (2012) suggested the time nurses spent with patients with PONV was significantly greater than with those without PONV, $p = .02$. These types of complications can raise challenges for PACU staff in terms of workflow when the PACU becomes congested. The outflow of patients from the PACU to the inpatient units or to discharge is halted and the PACU cannot receive any further patients from the operating room (Ganter et al., 2014).

The second component of the PICOT inquiry involved the usage of ASRS and MPI methods supported by the literature. Sherif et al. (2015) suggested using the ASRS for PONV is a simple and reliable test to identify patients at high risk and thus develop preventive treatment strategies. The ASRS identifies age, female gender, nonsmokers, history of PONV, motion sickness and postoperative opioid use as risk factors for PONV (Gan et al., 2014; Jin et al., 2020; Sherif et al., 2015). In Bruderer et al.'s (2017) study, the standardized approach to PONV prophylaxis resulted in no patient complaint of any retching or the morning after surgery, being postoperative day one. Intraoperative MPI was connected to significantly less PONV, shorter PACU durations, earlier postoperative oral intake, and shorter hospital stays (Bamgbade et al., 2018). The dosage of MPI should be administered based on each patient's estimated risk, adequate fluid therapy,

minimizing postoperative opioids, and use of total intravenous anesthesia (Stjernberg et al., 2018).

Identifying clinically important PONV will ensure earlier and more intensive preventive treatment can be given to patients, thus lessening PONV-related complications and preventing an extended hospital stay (Shin et al., 2018; Spitz de Souza et al., 2016). Despite data supported by the literature, Spitz de Souza et al. (2016) still found that algorithms for PONV management are not universally applicable between different patient populations and institutions. Institutions should evaluate their own guideline opportunities or limitations and areas for improvements to their processes in managing PONV. Furthermore, adherence to correct PONV prophylaxis should be re-evaluated systematically before discharge from the PACU To properly evaluate that PONV-susceptible patients did not receive inappropriate or underutilized PONV prophylactic measures (Gillmann et al., 2019; Spitz de Souza et al., 2016). Additionally, Finch et al. (2019) implied that providers need a keen awareness of patients at risk and medication interventions to decrease the episodes or incidences of PONV.

Nine relevant Level V articles were utilized in support of the PICOT question. The literature continues to endorse the notion that PONV impacts the quality of care by altering patients' transfers during the ambulatory course (e.g., discharge delay and unanticipated admission (Öbrink et al., 2015; Shaikh et al., 2016; Tabrizi et al.,2019). Per Pym and Ben-Menachem (2018), the occurrence of PONV caused significant delay in PACU discharges (30 minutes), $p < .001$. However, PONV reduction strategies were found to be significant (Feinleib et al., 2020). Pym and Ben-Menachem (2018) as well as Tabrizi et al. (2019) found heavy workload, errors in documentation, and noncompliance

by providers or staff also have an influence on PONV demonstrating even more reason that patients' baseline risk for PONV should be objectively assessed using a validated score based on independent predictors (Shaikh et al., 2016; Smith & Ruth-Sahd, 2016; Tabrizi et al., 2019).

Devising and employing an operational and successful PONV protocol should include the incorporation of liberally used preventive measures compared to restrictive measures (Kranke, 2015). The ASRS allows for prophylaxis administration that positively impacts patients' surgical outcome and experience (Smith & Ruth-Sahd, 2016; Tabrizi et al., 2019). Shin et al. (2018) suggested the ASRS is accurate and vital in identifying high-risk candidates for PONV and aids in the process of efficient management. Additionally, multimodal antiemetic administration from different classes was highly effective in the prevention of PONV due to multi-receptor antagonism leading to effective treatment (Turgut & Arslan, 2016). Partridge et al. (2016) corelated the timing of prophylactic administration in the operating room, length of stay in PACU. Partridge et al. (2016) also purported a second dose of prophylactics in the PACU resulted in a significant reduction in PACU length of stay. Moreover, Dzwonczyk et al. (2012) noted the average hospital cost per antiemetic ranges between $0.304 and $3.66; demonstrating prophylactic treatment for PONV is economically feasible, sound, and beneficial for the hospital and surgical centers when compared to expenses generated by treating patients returning to the hospital for PONV complications.

Summary

Chapter Two included a synopsis of the available literature in support of the PICOT question. In response to all the evidence noted in the literature affecting hospitals

and patients, it is assumed the identification of PONV through the usage of the ASRS and MPI modalities aid in the reduction of complications and will improve patient outcomes and experiences. These benefits will indirectly have a positive effect on an institution. The strategic methods outlined in Chapter Two are fundamental for the reduction of PACU length of stay. Throughout this chapter, the reader can intuit that PONV has multifaceted characteristics which can be identified and addressed to decrease PACU length of stay and improve cost efficiency for the institution. Chapter Three contains the context, measures, and ethical considerations for the DNP project.

CHAPTER THREE

METHODOLOGY

Context

This DNP project will be conducted at St. Mary's General Hospital (STM) in the perioperative department. STM is a 287-bed acute care hospital located in Passaic, New Jersey. The Medical Center provides a wide range of services such as surgical and medical care, intensive care, emergency care, and acute rehabilitation. The hospital cares for approximately 13,000 in-patients yearly and serves an additional 10,500 patients requiring same-day surgical procedures.

The perioperative department contains a total of seven functional operating rooms—two rooms dedicated to open-heart and Covid-19 patients, and five rooms for other surgical services. The average number of individuals who provides anesthetic services is seven anesthesia providers including, but not limited to, an anesthesiologist, a certified registered nurse anesthetist (CRNA), one perioperative registered nurse (RN), eight PACU RNs, surgical technicians, and administrators.

It is notable that STM encourages staff and faculty to partake in quality improvement (QI) and research projects to improve patient care and outcomes. As such, STM was a willingly participant in the combined effort of this project. This QI initiative involves a combined effort among health care providers and stakeholders who were active in early PONV recognition and proper treatment protocols. Health care workers such as anesthesia providers, surgeons, perioperative RNs, nurse managers, and educators all collaborated in executing the completion of this DNP project ultimately prioritizing and mitigating the incidence of PONV within the perioperative department (Öbrink et al.,

2015). DNP projects are pathways for initiating, managing, and sustaining change. Therefore, the DNP pathway enables providers to become highly qualified to become leaders and catalysts for creating new policies and other avenues of change by identifying clinical problems, seeking solutions, and implementing a viable and maintainable difference.

The nonuse of a PONV risk stratification tool contributes to the non-standardization of prophylactic therapy and facilitates outcomes such as a one treatment fits all approach. As a result, this DNP project involved implementing a standardized PONV protocol in the perioperative department ranging from early recognition through a risk stratification tool to multimodal drug interventions to reduce the incidence of PONV. Actualizing the PONV protocol as a DNP project established a positive catalyst for proper assessment and adequate prophylaxis administration, thereby decreasing patient distress, reducing health care costs, and minimizing the consumption of resources.

Stakeholders play a pivotal role in any QI project and it was no different in regards to this QI initiative. The key stakeholders within this project included the Chief Nursing Officer, Chairman of Anesthesia, Perioperative Nurse Manager, Head of Pharmacy, Chief of Surgery, Nurse Educator, and the Perioperative Director, all of whom have positively embraced the standardization of PONV assessment. These stakeholders agree a protocol would enhance awareness by recognizing patients at risk and preventing the negative symptoms of PONV that creates an unwanted domino effect such as disrupting the flow of patients and decreasing manpower when PONV leads to extended LOS in the PACU. The PONV protocol engages a multidisciplinary approach, enhancing collaboration, communication, and small partnership amongst health care professionals.

This DNP project's objective was to decrease PONV by creating a tailored care plan that is beneficial, while incorporating and maintaining national standards for patient satisfaction, preventing discharge delays, and fostering a positive patient experience.

Substantial challenges should be addressed before implementing a QI project. These challenges may consist of considerations such as: budget, stakeholders, quantifiable goals, resources, barriers, completion timeframe, and other relevant factors (Fischer et al., 2016). As such, successful implementation of this QI project required recognizing barriers and forming an actionable plan to overcome those barriers.

Two perceived barriers identified within the clinical setting included gaps in communication and resistance to change by health care providers. Communication that is effective amongst providers is critical in the perioperative setting resulting in a safer work environment, reduced adverse events, and improved patient outcomes (Fischer et al., 2016). Ineffective communication is corrected by enforcing the perioperative department to utilize a standardized communication tool such as the Situation, Background, Assessment, Recommendation (SBAR) technique, a form which is already in place at the facility. SBAR promotes effective and relevant communication among project team members and perioperative staff to enhance PONV protocol's success by acknowledging information that can be missed or overlooked. Meetings held amongst stakeholders and project team members decrease the communication gap by allowing professionals to voice concerns, make adjustments, adopt changes, and maintain meaningful engagement.

The health care industry is constantly changing due to advances in technology and the application of evidence into the practice setting. Therefore, it is advantageous to

evaluate openness, willingness, and proclivities of individuals in regards to change in general, as well as change concerning the PONV protocol. It was deemed there was a degree of resistance to change upon evaluation, and this was deemed the second barrier of change within this project's implementation. Furthermore, it could be postulated that resistance to change is overcome with education and open communication. Education can be considered a leveraging measure that can be employed to disprove any unfounded beliefs, in accordance with open communication that allows for root cause analysis, fears, and opinions to be expressed freely. These processes decrease resistance by readjusting concerns and attitudes about the PONV QI project. Project team members properly educated providers on the relevance and importance of PONV recognition and treatment which, in turn, improves patient outcomes. With support from the Chairman of Anesthesia and Nurse Manager of the perioperative department, these barriers would be tackled deliberately and efficaciously through multidisciplinary approach.

Interventions

A pre- and post-design would be utilized for this QI project where baseline and implementation data are compared. The data determine the outcomes of a standardized PONV protocol through ASRS and MDIs in the perioperative department at STM. The desired number of participants is 750 de-identified patients. The first 50 de-identified aggregate data from the preoperative intake by the preoperative RN will be chosen based on the following criteria: (a) adults (age 18 or older); (b) undergoing elective outpatient surgery; (c) receiving general anesthesia; (d) able to speak English or Spanish; and (e) without significant medical history. The term without significant medical history is defined by the American Society of Anesthesiologists (ASA) physical status

classification system as a person with a BMI < 30 or who has mild to moderate systemic disease such as controlled hypertension and diabetes (ASA, 2014). The exclusion criteria include emergency cases, ASA score greater than 3, regional anesthesia, monitored care anesthesia, local anesthesia, and pediatric population ranging from ages 0–17 years. There is no limitation based on race and ethnicity. The demographic variables include age, gender, type of surgery, height, and weight. Postoperative nausea occurrence, postoperative vomiting occurrence, PACU interventions, PACU length of stay, and unintended hospital admission were designated as outcome variables.

The project implementation period was slated to begin March 1, 2021 and conclude on June 1, 2021. However, due to restrictions related to the COVID-19 pandemic, the implementation was adjusted by 6 weeks. The new implementation period was Tuesday, April 20, 2021 through Tuesday, June 1, 2021. Seven anesthesia providers including an anesthesiologist, six CRNAs, eight perioperative RNs, and eight PACU RNs volunteered to participate in the QI project. The anesthesiologist and CRNAs were selected because these clinicians are directly responsible for the initial perioperative assessment encounter and are unequivocally responsible for devising a PONV prophylactic plan.

The RNs are responsible for following through with the established plan during preoperative intake. Once the patient enters the PACU, RNs communicate with anesthesia personnel about PONV occurrences and patient outcomes documentation. A PowerPoint presentation was provided to the perioperative staff through a coordinated in-service with the unit nursing educator. Pharmacy played a vital role by verifying that the

requested pharmacological interventions were available. IT personnel acted as guides in developing and incorporating the ASRS tool within the EMR.

The QI project collection was comprised of a two-part design segment: pre-data (baseline) and post-data (implementation), which was collected over a total of 6 weeks. First, the aggregate baseline data collection began via the EMR. The control group was established through chart review of all patients who met the criteria from January and February 2021 using the EMR. This group was not treated using the ASRS tool and was labeled the non-ASRS group. The aggregate data collected included incidence of PONV and length of stay in PACU. The de-identified aggregate data collected were logged into an 8–16-character password protected Microsoft Excel worksheet, which was given to and analyzed by the statistician for clinical significance.

During the implementation data process, the intervention group known as ASRS Group ran its course for 6 weeks from April 20 to June 1. These participants were screened preoperatively using the ASRS tool and reassessed postoperatively for any signs of PONV. The ASRS questionnaire tool is one of two sources for gathering data (see Appendix C). It collects the following information by giving a score of 0 (no) or 1 (yes) to: (a) female gender, (b) history of motion sickness or PONV, (c) nonsmoker, and (d) use of postoperative opioids. Aggregate data were collected from the perioperative intake by the preoperative RN or by anesthesia providers during the pre-anesthesia evaluation.

Each question generates a score that is entered into an algorithm and places the patient into a low-, medium-, or high-risk antiemetics group. Those who are low-risk have scores from 0–1 and typically receive zero or one medication. Medium-risk patients score 1–2 on the Apfel scale and are prescribed two medications from the different drug

classes. A score that is greater than or equal to 2 places a patient in high-risk where three or four more medications are prescribed (Gan et al., 2020; Jin et al., 2020). This form heavily relied on anesthesia providers and preop RNs to complete the form completely and accurately.

The aggregate de-identified data from the ASRS group during the preoperative questionnaire were further divided into variables collected in three phases: preoperative, intraoperative, and postoperative. Preoperative variables compiled by anesthesia providers included age, gender, smoking status, ASA class, type of surgery, preoperative antiemetics, type of anesthesia, and type of surgery. Intraoperatively, the anesthesia provider collected data of anesthesia duration of time, intraoperative antiemetics, intraoperative analgesia, and fluid intake. Lastly, postoperative variables included postoperative nausea occurrence, postoperative vomiting occurrence, PACU interventions, PACU LOS, and unintended hospital admission postoperatively.

The above variables were compiled by the PACU RN. The cumulative de-identified variables relied on anesthesia providers and RNs completing the form accurately and adequately. All responses were not applied to the chart but rather in a locked box with access only by the principal investigator. Additionally, all accumulated data collected were de-identified and recorded into a password protected Excel spreadsheet, which was compared and analyzed for clinical significance by a designated statistician. Both baseline data and implementation data outcomes were compared for statistical and clinical significance. The team involved in implementing of the QI/DNP project consisted of a doctoral prepared project team member, project chairman, principal investigator, and a mentor who all acknowledged their role in the project.

Study of the Interventions

The ASRS tool was critical in addressing the issue of PONV. The tool was validated by meta-analysis and randomized clinical trials and further endorsed by expert panels within SAMBA (Apfel et al., 1991; Gan et al., 2014). The score was standardized and accepted by the governing body of anesthesia providers and others that administer anesthesia (Gan et al., 2014, 2020). Implementing ASRS, a portion of the SAMBA guidelines, at the project site provided better control and management of the PONV complication by utilizing the score to identify individuals at risk while providing recommended prophylactic medications based on patients' Apfel score. Performing a baseline chart review and postintervention chart review allowed for contrasting PONV incidence and PACU LOS with or without treatment. This comparison allowed for clinical significance. The outcome of this QI project on PONV assessed whether this new protocol causes a significant reduction in nausea, vomiting, and time spent in the PACU.

Measures

Permission to utilize ARSA and MDI from the SAMBA Consensus Guidelines was granted by Dr. Tong Gan (see Appendix D). Implementation of the ASRS tool recommended by SAMBA aids in guiding PONV as a QI project. Therefore, it is vital for anesthesia providers and the perioperative department to understand how to manage PONV effectively. The first outcome measure is to identify those at risk for PONV with the ASRS tool. The demographic within the ASRS include age, gender, smoking, history of PONV, history of motion sickness, and postoperative opioids administration. A generated score from the ASRS tool aids in early PONV treatment. Patients with two or higher scores are given two antiemetics intraoperatively (Gan et al., 2014). Masiongale et

al. (2018) suggests that the onset of PONV can occur within 30, 60, and 120 minutes after surgery. The second outcome measure examines whether there is a decreased rate of PONV incidence in the PACU and a decreased LOS, which would contribute to implementing SAMBA guidelines as a reference tool. Postoperative nausea occurrence, postoperative vomiting occurrence, PACU interventions, PACU length of stay, and unintended hospital admission are measurable outcome variables. This QI project would decrease PONV significantly and the overall time spent in the PACU.

Analysis

Utilizing statistics was an essential tool to express data scientifically which is needed to show the PICOT question results mentioned prior. Statistics was defined as an "empirical method for collecting, organizing, summarizing, presenting data, and to make inferences about the population from which the data are drawn from" (Kim & Mallory, 2017, p. 16). All aggregated data results that have been collected are then transcribed into Microsoft Excel and analyzed utilizing the Statistical Package for Social Sciences. Gender, type of surgery, type of anesthesia used, postoperative nausea occurrence, and postoperative vomiting occurrence are categorized as nominal variables while ASA status and Apfel score are categorized as the ordinal variables.

In the aggregated baseline data collection, frequency was utilized to determine the occurrences of nausea and vomiting. The test that best evaluates the method PICOT question was a *t-test*. It entails comparing the dependent and independent groups showing the significant difference within the means of the variable to aid in the questioned hypothesis (Kim & Mallory, 2017). The test will first measure PONV on arrival to the PACU and before discharge to home. Second, determining whether PONV on arrival was

associated with the PACU length of stay. Recovery time data would be determined by *t-test* and chi-squared analysis. The data resulted would be given a mean value on the standard deviation curve with the hopes of having a p-value >0.05, which would be statistically significant. Validity and minimizing error are completed by utilizing inferential statistics. These results would help spearhead the PONV initiative within the perioperative department. PONV prophylaxis aims to decrease the incidence, patient-related distress, and reduce healthcare costs (Gan et al., 2014).

Budget

The outcome of this project benefits the quality of care delivered and the safety of patients. There was no grant funding for this project. The medications utilized to treat PONV, such as antiemetics, anticholinergics, steroids, and antihistamines needed for this QI project, are on formulary and would not accrue any additional costs to the facility or department (see Appendix E). The department would not be required to purchase any medication that is not on formulary. Additional providers are currently on salary and after one-year ASRS tool would be built into EMR. The principal investigator purchased paper, pens, and a printer to print the ASRS. Microsoft Excel and Word software was a significant instrument utilized to ensure data collection was successfully processed. A statistician was be needed to analyze data collected for statistical and clinical significance.

Ethical Considerations

The implementation of this project was scheduled to begin with approval from the project site (see Appendix F). Additionally, approval base on the Human Subjects Research Application by the Wilmington University was obtained (see Appendix G).

Training was completed on protecting human subjects through the Collaborative Institutional Training Initiative (CITI) program (see Appendix H). No formal consent was required for this QI project because medication treatments are currently circulated within the facility. However, concerning basic ethical principles, the investigator considered the principles of respect for persons, beneficence, and justice for the implementation of this QI project. There were no foreseeable immediate or long-term risks or anticipated harm from participation in this study. A strictly voluntary and anonymous participation process accomplished respect for persons. If participation in this study brought up feelings that made the participant uncomfortable, they were advised to stop participating. Additionally, the decision to not participate did not impact the care patients received during the surgical process. Each participant was provided clear informed consent and was free of force, fraud, deceit, or coercion, reflecting the principle of respect for persons (Terry, 2018).

Anonymity was maintained throughout the study and participant data were deidentified. No identifiable data were collected, and no data accessed by the investigator linked back to participants. The de-identified data collected adhered to HIPAA policy and was recorded into an 8–16-character password protected Microsoft Excel worksheet only accessible to the principal investigator and secondary researcher. Anesthesia providers and RNs were directed to give completed forms to principal investigator, secondary researcher, and the Chairman of Anesthesia. The collected data was planned to be kept for a mandatory 3 years by Wilmington University and later destroyed.

Summary

PONV negatively impacts both the patient and the managing facility. Therefore, an interdisciplinary collaboration approach among providers is needed to initiate and answer a PONV clinical inquiry. This baseline data and implementation data collection was designed to uncover the overall incidence of PONV and patient LOS in the PACU. All de-identified data were collected from the hospital's EMR without compromising privacy. Staff and leadership were extensively educated and informed of the data to be collected and the importance of accurately documenting the data. The data within the EMR produced a baseline incidence of PONV and the current patient in the PACU to gain insight for comparison against pre- and post-implementation data. The aim was that with an ASRS and MPI protocol, there would be a significant reduction in the incidence of PONV and better compliance with the treatment regimen (Dewinte et al., 2018). Chapter Four contains a discussion of the results and sample characteristics of this project.

CHAPTER FOUR

RESULTS

Sample Characteristics

The data outcomes were derived from two groups for statistical comparison. The baseline sample dataset consisted of outpatient elective candidates receiving general anesthesia and their LOS in the PACU between the dates of January and February 2021. This nonintervention group was known as the non-ASRS group. The intervention group (ASRS group) dataset was collected from April 20th to June 1st 2021. This group had elective outpatient surgery, received general anesthesia, and were managed with the ASRS and MPI, as recommended by SAMBA for this project.

Descriptive and inferential statistics were calculated using the Statistical Package for Social Sciences (SPSS) Version 27 (https://www.ibm.com/analytics/spss-statistics-software). Of the 238 reports submitted, 87 were excluded due to incomplete data. 151 valid reports with differences in reported data for descriptive statistics are summarized in Table 4.

The average age of participants in the project was 47 years old (n = 183) with 66% reported as female (n = 100) and 34% reported as male (n = 51). Regarding the APFEL Scoring out of 151 completed scores, 100 patients were female, 16 had a history of post operative nausea and vomiting, 111 were nonsmokers, and 146 received opioids post operatively resulting. Some APFEL scores were entered as a numeric value only without reporting on the 4 various criteria, resulting in a total of 173 patients receiving an APFEL score with 41% with an APFEL score of 3, 40.5% with an APFEL score of 2, 8% with an APFEL score of 1, 5% with an APFEL score of 4, and 0.4% with an APFEL

score of 0 in this study. Sixty-three percent of the cases were ASA Class II. Fifty-four percent of the cases were considered general surgery with 24% as gynecological. All cases analyzed in the project underwent general anesthesia.

Table 4

Descriptive Statistics

Variable	Value
Age (*n* = 183)	
M	46.96
SD	15.8
Minimum	7.0
Maximum	86.0
Duration of Anesthesia (minutes; *n* = 148)	
M	90.5
SD	57.7
Minimum	16.0
Maximum	499.0
Fluid Intake (mL; *n* = 153)	
M	964.0
SD	411.0
Minimum	250.0
Maximum	2200.0
APFEL Score (*n* = 173)	
0	1
1	19
2	70
3	71
4	12
Patient Received Pre-Op Antiemetics (*n* = 151)	
Yes	45
No	106
Patient Received Intra-Op Antiemetics (*n* = 169)	
Yes	165
No	4
Patient Experienced Post-Op Nausea (*n* = 193)	
Yes	16
No	177
Patient Experienced Post-Op Vomiting (*n* = 193)	
Yes	2
No	191

Patient Received Interventions for Post Op Nausea-Vomiting (*n* = 184)	
Yes	15
No	169

Results

The PICOT questions was: *In adults undergoing outpatient surgery receiving general anesthesia, how does the implementation of the ASRS assessment and SAMBA treatment protocol when compared to current practice affect incidence of PONV and PACU length of stay over a 6-week period*? The analysis of data consisted of tests to examine the relationship between PACU LOS and APFEL score and between PACU LOS and MPI) that were hypothesized to have an effect. Patients with an APFEL score of 2 and 3 (68.5%) who were treated with MPI based on management experienced no postoperative nausea or postoperative vomiting in the PACU, yielding clinical significance. A Spearman's rank-order correlation assessed the relationship between PACU LOS and APFEL score. The analysis included 145 valid patient forms. There was no statistically significant correlation between APFEL score and PACU LOS, (r_s (143) = -.062, p = .457. Contrary to the literature, the correlation between PACU LOS and APFEL score was not replicated in the data.

Table 5

Spearman Rank-Order Correlation Between LOS and APFEL Score

	1	2
1. APFEL Score	-	-.062
2. LOS in PACU	-.062	-

Note: N = 145

Next, a multiple regression was run to predict PACU LOS in minutes from APFEL score and receipt of pre-op antiemetics and receipt of intraoperative anti-emetics.

R^2 for the overall model was 18.8% (Table 6). The multiple regression model did not statistically significantly predict PACU LOS, $df(3, 123) = 1.5$, $p = .218$.

Table 6

PACU LOS Regression Model

Model Summary [b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.188[a]	.035	.012	50.746	2.316

a. Predictors: (Constant), Pt Received Intraop Anti-emetics, Pt Rec. Pre-op_Antiemetics, APFEL Score

b. Dependent Variable: Length of Stay in PACU

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11585.719	3	3861.906	1.500	.218[b]
	Residual	316748.501	123	2575.191		
	Total	328334.220	126			

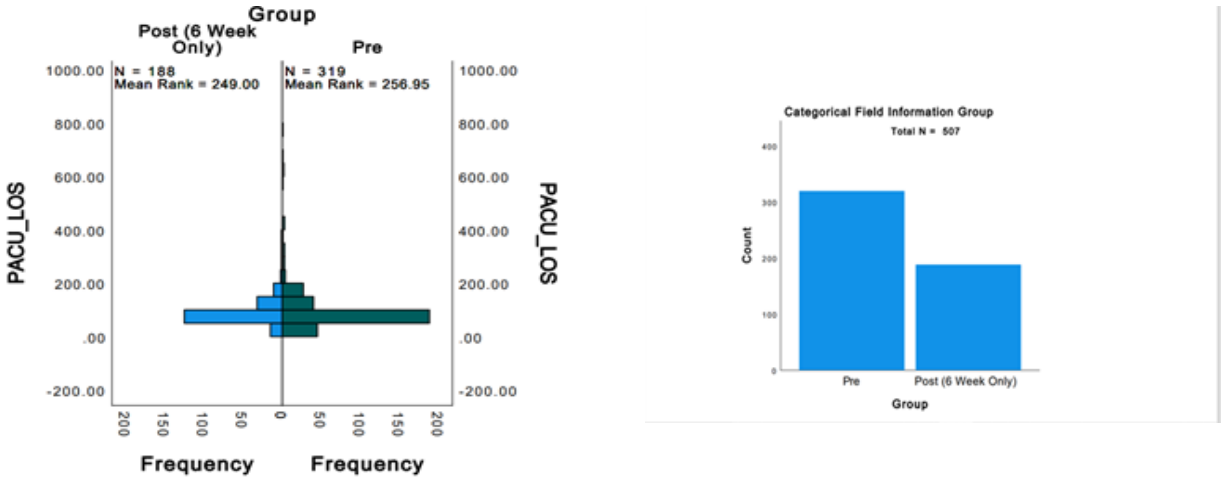
a. Dependent Variable: Length of Stay in PACU

b. Predictors: (Constant), Pt Received Intraop Anti-emetics, Pt Rec. Pre-op_Antiemetics, APFEL Score

Finally, a Mann-Whitney U test was run to determine if there were differences in LOS in the PACU for those prior to the intervention (January/February) and during the 6-week intervention period. Distributions of LOS in minutes were similar, as assessed by visual inspection (Figure 4).

Figure 4

Preintervention and Postintervention



PACU LOS was not statistically different in the pre-intervention period (*Mdn* = 75) than during the intervention period (*Mdn* = 72), *U* = 29046, *p* = .555; however, these values were clinically significant. This 15-minute improvement in PACU LOS signifies value by acknowledging that the implementation of the ASRS and MPI benefits the department by improving patient outcomes along with clinical skills in relations to PONV.

Summary

The ASRS tool was supported in the literature; however, when translated into the clinical setting, the findings from the inferential analyses suggested no statistical significance, but some clinically significance, which is useful. There was clinical significance of 15-minute improvement in overall PACU LOS between the pre-intervention group and post-intervention group as the intervention group was identified utilizing the ASRS and managed with MPI. The cost effectiveness of ASRS and ease of use were critical in this project for they did not hinder workflow within the perioperative

department. Verbal feedback from the staff suggested there were less patients complaining of PONV during the implementation phase; assessing risk scores took less than a minute; decreased incidence of vomiting; and improved patient outcome. Additionally, the institution did not accrue any further cost as MPI through antiemetics were available for use.

CHAPTER FIVE

DISCUSSION AND IMPLICATIONS

Interpretation

While the data demonstrate non-statistically significant findings, it should be noted that the intervention period of 6 weeks involved a sample of 238 patients and there were numerous missing data that could likely influence the findings. In addition, the final analysis comparing pre-intervention data from the PACU in January and February (n = 319) to data during the interventional period (n = 188) had multiple outliers, indicating that lengthy stays in the PACU are a common occurrence in this facility. In fact, minimum and maximum PACU length of stay was 28–770 minutes for the pre-intervention group and 38–371 minutes for the post-intervention group. Therefore, to run a parametric *t*-test, an assumption that must be met is the removal or adjustment of any outliers.

Considering the numerous outliers, the question to be asked is, "it is important to consider lengthy stays in the PACU as valid points in the study if they are common occurrences since the aim of this study was to reduce LOS in the PACU". As a result, keeping the outliers indicated a rationale to examine the data with the outliers in the dataset, resulting in a violation of using parametric testing and the use of means for PACU LOS as the comparison. The Mann-Whitney U test, run on the median time-point for the pre-intervention group (75 minutes) versus the intervention group (72 minutes) was not statistically significant.

There are calls from the American Statistical Association to abandon the term *statistical significance* (Wasserstein & Lazar, 2016; Wasserstein et al., 2019) and calls in

nursing to examine practical importance or clinical importance (Spurlock, 2019). From a practical and clinical significance standpoint, these results are important to perioperative care. The mean LOS for the pre-intervention group was 101.4 minutes (*SD* = 92) whereas the mean length of stay for the intervention group was 86.4 minutes (*SD* = 45). The mean difference between pre-intervention and intervention time-points is 15-minute improvement, which is a clinically significant finding that facilitates the path to decrease PACU LOS, improve PACU RN patient ratio, decrease the need for medication/supplies, expedite discharge from the OR to PACU, and enable less of a delay in the flow of surgical services leading to improved quality care and patient satisfaction (Ganter et al., 2014; Partridge et al., 2016). The value of 15-minute improvement shows that the proposed guidelines are effective in reducing PONV symptoms overall and decreasing time spent within the PACU.

Furthermore, an outlier is typically thought of as 2 *SD* above the mean. This would indicate an outlier in the pre-intervention group would be any PACU LOS > 289 minutes, whereas an outlier in the intervention group would be any PACU LOS > 176 minutes. This indicates that in the pre-intervention group, there were numerous cases that varied away from the mean, as indicated by a *SD* two times that of the intervention group. The difference in *SD* indicates that LOS in the intervention group was much closer to the mean, whereas LOS in the pre-intervention group was more spread. In fact, in the pre-intervention group, there were 19 cases that were greater than 200 minutes in the PACU, as opposed to only 5 in the intervention group. Therefore, reducing this study to non-statistically significant findings alone without exploring the practical significance of this intervention would be intellectually and dutifully negligent. A difference in 15 minutes

and reduction of 14 outlying cases warrants further investigation of the use of this protocol because it may increase patient satisfaction, improve outcomes with a decrease in symptoms, and reduce PACU LOS with further replication of this project. Therefore, a 15-minute improvement is clinically as evidenced and verified by the data and outcomes of this QI project.

Limitations

The most significant limitation to the QI project included the time length of only six weeks to implement. A standard of three months for data collection would have been ideal but this was nullified by the COVID-19 pandemic and hospital restrictions that were put in operation during the ideal and desired study timeline. Additionally, due to a small sample size, the findings are unable to be generalized and precisely reflect the potential impact to the institution's PONV prevention practices. Also, the non-readiness for practice change, a lack of consistent reporting, omission of data by anesthesia providers or recovery nursing staff, and adherence to the protocol data sheet contributed to some forms being eliminated as they did not meet the criteria.

Providers administering antiemetics based on their preferences over implementation guidelines is another limitation to this project. Finally, data reliability was dependent on the respondent's accurate interpretation of questions and ability to provide truthful responses, which cannot be verified. Suggestions for further research include comparing equivalent time periods, strict adherence to protocol, and required completeness of documentation to better discern the effects of the protocol. In the end, the sample size, compliance, time restriction, and lack of standardized PONV reporting

are all factors that limited the intervention results. This was done at a single medical center and not conducted on a multicenter level which negates generalizability

Implications for Advanced Nursing Practice

Improving patient care, outcomes, and clinical skills through EBP is the primary implication for advanced nursing practice. In the absence of research, literature gaps further exist and could not be identified, nor translated into the clinical practice. Therefore, new knowledge obtained through evidence and implemented in the clinical setting will improve quality care, patient outcomes, and provide cost-savings and increased revenue from reimbursement. In the clinical setting, PONV prevention outcomes are often not considered of extreme importance when compared to other complications related to anesthesia such as malignant hypertension, anaphylaxis or allergic reaction, nerve injury, anesthesia awareness, and tooth damage, however this project sheds lights to the gravitas of this incidence and prevalence of PONV in the clinical setting (Nagelhout, 2018).

PONV is a factor of quality care and patient satisfaction, which are significant components affecting organizational reimbursement rates (Gan et al., 2020; Nagelhout, 2018). As noted, PONV can be costly to an institution as patients often stay in the PACU for an extended length of time, thus delaying the flow of continued service (Ganter et al., 2014; Partridge et al., 2016). In this doctoral project, PONV was not eliminated but rather reduced as there were minimal interventions with the PACU stay. This QI project concluded 68.5% patients with an APFEL score of 2 and 3 who were treated with MPI based on management experienced no postoperative nausea or postoperative vomiting in the PACU, yielding noteworthy clinical significance. In addition, the SAMBA

recommendations showed a 15-minute improvement in PACU LOS when comparing pre-implementation data to post-implementation data. The algorithm from SAMBA combined with the ASRS would help the preoperative experience be more pleasant and reassure confidence in the anesthesia process, making sure as providers are doing everything to administer quality and safe anesthesia for PONV patients.

Plan for Sustainability

The key factor for the sustainability for this project is related to clinical significance at the institution. The amount of relief reduction of PONV can be achieved with the available antiemetic regimens recommended by SAMBA (Gan et al., 2014; Gan et al., 2020; Teunkens et al., 2017). PONV risk stratification usage of ASRS and MPI are valuable factors that are profitable and maintainable due to Center of Medicare and Medicaid Services (CMS) reimbursement. Medicare currently has the Physician Quality Reporting System or Merit-based Incentive Payment System (MIPS) for data quality collection reporting. The MIPS Measure #430 focuses on PONV and combination therapy measures in which Medicare recognizes the importance of PONV based on the quality data reports (ASPIRE, 2017).

CMS suggests that a percentage of patients over 18 years of age who are exposed to inhalational anesthetics for general anesthesia are at significant risk for PONV and should receive combination therapy consisting of at least two prophylactic pharmacologic antiemetic agents (ASPIRE, 2017). MIPS is a patient-centered and safety outcome in anesthesia. Providers are required to document the administration of antiemetics in order to comply with CMS to obtain reimbursements for the department and facility. This form of accountability reporting system helps to ensure the delivery of a high-quality and cost-

efficient care. By having PONV as a quality measure, the sustainability of the protocol is warranted.

Another method for sustainability is the Hospital Consumer Assessment of Healthcare Provers and Systems (HCAHPS). HCAHPS is a standardized national survey created by CMS in collaboration with the Agency for Healthcare Research and Quality to identify and measure patients' perceptions of care received during their hospitalization (CMS, 2021). Patient satisfaction scores are critical tools needed by institutions in the United States and are a prerequisite for optimal service reimbursement by CMS. Therefore, improving patient satisfaction was selected as a priority due to its propensity to contribute to cost-savings and generate income, as it concurrently promotes optimal patient outcomes. A hospital's performance is evaluated on various measures that may compromise each domain via federal mandates that determine how much value each domain will be given to calculate the hospital's total performance score during each year (CMS, 2021).

Moreover, health care is currently on a grading system; placing healthcare delivery on a continuum where it needs to position itself to be graded highly within this system. From this premise, it is easy to conclude that PONV prophylaxis would position healthcare delivery at a higher rung on the discussed grading system. As such, the PONV protocol would help the preoperative experience to be more pleasant, reassure confidence in the anesthesia process and in the institutions, making sure that providers are doing their very best to administer quality and safe anesthesia for PONV-prone patients.

From here, consumers may move on to other facilities or provide bad reviews on the internet after an experience of PONV at one facility (Feinleib et al., 2020; Teunkens

et al., 2017). This is beneficial in regards to patient experience, facility reputation, and reviews of the institutions via word-of-mouth dissemination of information or internet-based ratings. As a result, negative feedback may impact revenue, even if surgical outcome was successful, as the health care system is in the business of pleasing consumers and increasing patient satisfaction.

Application of the AACN DNP Essentials

The DNP Essentials were fulfilled throughout this quality improvement project as outlined by the American Association of Colleges of Nursing (2006). The Essentials serve as guidance for making providers responsible for administering quality care through processing, requesting feedback, and problem- solving techniques to improve outcomes or adherence (AACN, 2006). Thus, properly identifying patients' risk factors during the perioperative intake allows for integration of DNP Essentials through the project inquiry and implementation of PONV coverage. The following sections depict how a PONV protocol correlated with the DNP Essentials.

Essential I: Scientific Underpinnings for Practice

Essential I: Scientific Underpinnings for Practice was met by this project implementing literature verified, and evidenced-based guidelines which were the framework and presiding factors of the project. The literature demonstrates the efficacious nature of PONV prophylaxis. As such, PONV prophylaxis was executed and supported in the clinical setting and in the literature concurrently (Gillmann et al., 2019). By acknowledging that there is plenty of research available that establish and confirm the benefits and value of antiemetic drugs and treatments for PONV, scientific underpinnings for practice were clearly exemplified in this QI project. From this premise, looking to

research and nursing theories to implement a project in practice is vital, especially via the lens of its foundation being based in the scientific practice of nursing.

Essential II: Organizations and Systems Leadership for Quality Improvement and Systems Thinking

Essential II: Organizations and systems Leadership for Quality Improvement and Systems Thinking was met due to the fact that health care is currently on a grading system. PONV is not life-threatening but a nuisance that can affect institutions and the community they serve. The patient's experience, facility reputation, and reviews of the institutions via word-of-mouth dissemination of information or internet-based ratings are all critical factors. Stakeholders are acknowledging the significance of this complication. Therefore, analyzing incidence, documentation of PONV, interviewing staff, reviewing data from postop discharge calls influence feedback in order to address the issue of PONV. As a result, exploring pattern of human behavior and interaction with the environment to create positive changes in patients affected with PONV. Hence, awareness for clear-cut risk assessment and prediction of PONV and the implementation of a management algorithm in the perioperative area with repetitive evaluation of patients' outcome are crucial for quality control and management (Dewinte et al., 2018).

Essential III: Clinical Scholarship and Analytical Methods for Evidence-Based Practice

Essential III: Clinical Scholarship and Analytical Methods for Evidence-Based Practice was completed by performing a Spearman's rank-order correlation assessed the relationship between PACU LOS and APFEL score. Next, a multiple regression was run to predict PACU LOS in minutes from APFEL score and receipt of pre-op antiemetics

and receipt of intraoperative anti-emetics. Lastly, a Mann-Whitney U test was run to determine if there were differences in LOS in the PACU for those prior to the intervention. By accessing data related to how often PONV occurs, different management techniques required to control symptoms, and how long PACU time was affected through interviews and audits in accordance with the literature.

Essential IV: Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Health Care

Essential IV: Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Health Care was met by consulting with Information Technology (IT) to build the PONV risk assessment tool into the EMR that is utilized during the perioperative intake preventing a hindrance in workflow. A computer-generated questionnaire within the EMR to promote adherence and compliance for patient identification. Unfortunately, this would take about one year to be built into the system after collaboration.

Essential V: Health Care Policy for Advocacy in Health Care

Essential V: Health Care Policy for Advocacy in Health Care was met utilizing the CMS healthcare policies to help direct QI project. As mentioned previously, a section of CMS focuses on PONV. CMS suggested that patients receive combination therapy consisting of at least two prophylactic pharmacologic antiemetic agents when administering general anesthesia (ASPIRE, 2017). Providers are required to document antiemetics administration in order to comply with reimbursement requirements. Creating a policy would decrease the variable drug options consider by providers for a more formal regimen to improve symptoms of PONV through recommended consensus

guidelines by SAMBA (Gan et al., 2014). The PONV protocol was in alignment with federal mandates for quality care and discuss your data on reimbursement, decreased LOS, and patient satisfaction measures. Unifying drug management for providers will yield positive outcomes for PONV patients and the institution, which increase cost-effectiveness.

Essential VI: Interprofessional Collaboration for Improving Patient and Population Health Outcomes

Essential VI: Interprofessional Collaboration for Improving Patient and Population Health Outcomes was accomplished by collaborating with leaders from multiple departments such as Perioperative Nurse Manager, Nurse Educator, Chairman of Anesthesia, IT, Head of Pharmacy, Chief of Surgery, and the Perioperative Director to discuss the issues surrounding and concerning PONV through assessment findings and a potential plan of execution, which would take into drug cost and barriers that might be expected during implementation. Successful collaboration benefitted the principal investigator, staff satisfaction, patient satisfaction, and potential stakeholder satisfaction via positive metrics and suspected future income due to benchmarks for quality measures being met during the project timeline. By reducing LOS by 15-minutes patient and population health outcomes were improved. This significance led to decreased occurrences of untoward outcomes of PONV.

Essential VII: Clinical Prevention and Population Health for Improving the Nation's Health

Essential VII: Clinical Prevention and Population Health for Improving the Nation's Health was acknowledged by identifying that PONV is a frustrating

complication after general anesthesia. By identifying patients at risk, keeping the baseline risk low, and proactively administrating prophylactic antiemetics to low and high-risk patients, providers may diminish the potential of harm from the anesthesia complication.

Essential VIII: Advanced Nursing Practice (APN)

Overall, the goals of Essential VIII: Advanced Nursing Practice (APN) were met by impacting a change in practice operation. The role of the anesthesia APN is pivotal in ordering drugs and educating the perioperative staff. This is further executed base on the results of the project. Patients with an APFEL score of 2 and 3 (68.5%) who were treated with MPI experienced no postoperative nausea or postoperative vomiting in the PACU, yielding a clinical significance. Thus, a guided protocol emerged in evidence, which could assist in clinical decision making for the treatment of PONV. Further decreasing the incidence of PONV can improve patient satisfaction and limit the length of stay in recovery.

Conclusion

An approved project is necessary to obtain new knowledge for PONV reduction strategies. However, when designed and executed by an APN To promote quality measures for a scholarly project and to impact current and future care delivery, that project becomes more significant. As the principal investigator, this writer was in a prime position to disseminate information, implement strategies, to ultimately improve patient outcomes (AACN, 2006). The literature supports the notion that PONV affects the population about 30-70% after receiving inhalational general anesthesia, depending on risk factors such as sex, smoking status, history of PONV and motion sickness (Dewinte et al., 2018; Feinleib et al., 2020; Gan et al., 2020). When presented with research

evidence and tools to guide practice change, the perioperative staff were eager and ready to implement the PONV QI project. The scholarly QI project was carried out over a six-week period after obtaining permission from Dr. Tong Gan to utilize the SAMBA guidelines to identify and treat PONV as validated tool, along with the project being approved by the Chief Nursing Officer at STM.

The results from data compared between pre and post SAMBA intervention implies that with a protocol development, there was a clinical significance of a 15-minute improvement in PACU LOS by reducing PONV, which in turn, enhances patient satisfaction and facilitates quicker and optimal discharge post-surgical procedure. Additionally, 68.5% patients with an APFEL score of 2 and 3 that who were treated with MPI based on protocol management experienced no postoperative nausea or postoperative vomiting in the PACU. The development of a risk stratification tool and drug intervention protocol demonstrated the potential to improve PONV prevention practices at a community medical center. However, the limited results are indicative of further exploration or study replication to determine if the protocol would duplicate similar and causal results regarding PONV and PACU LOS. The project conducted on a larger scale with a larger sample size may have impacted the effects of the to make data more intently generalizable. This scholarly QI project demonstrated exciting results that are clinically significant, demonstrate suspected clinical and financial value, and ultimately, would conceptually endorse optimal patient satisfaction and outcomes.

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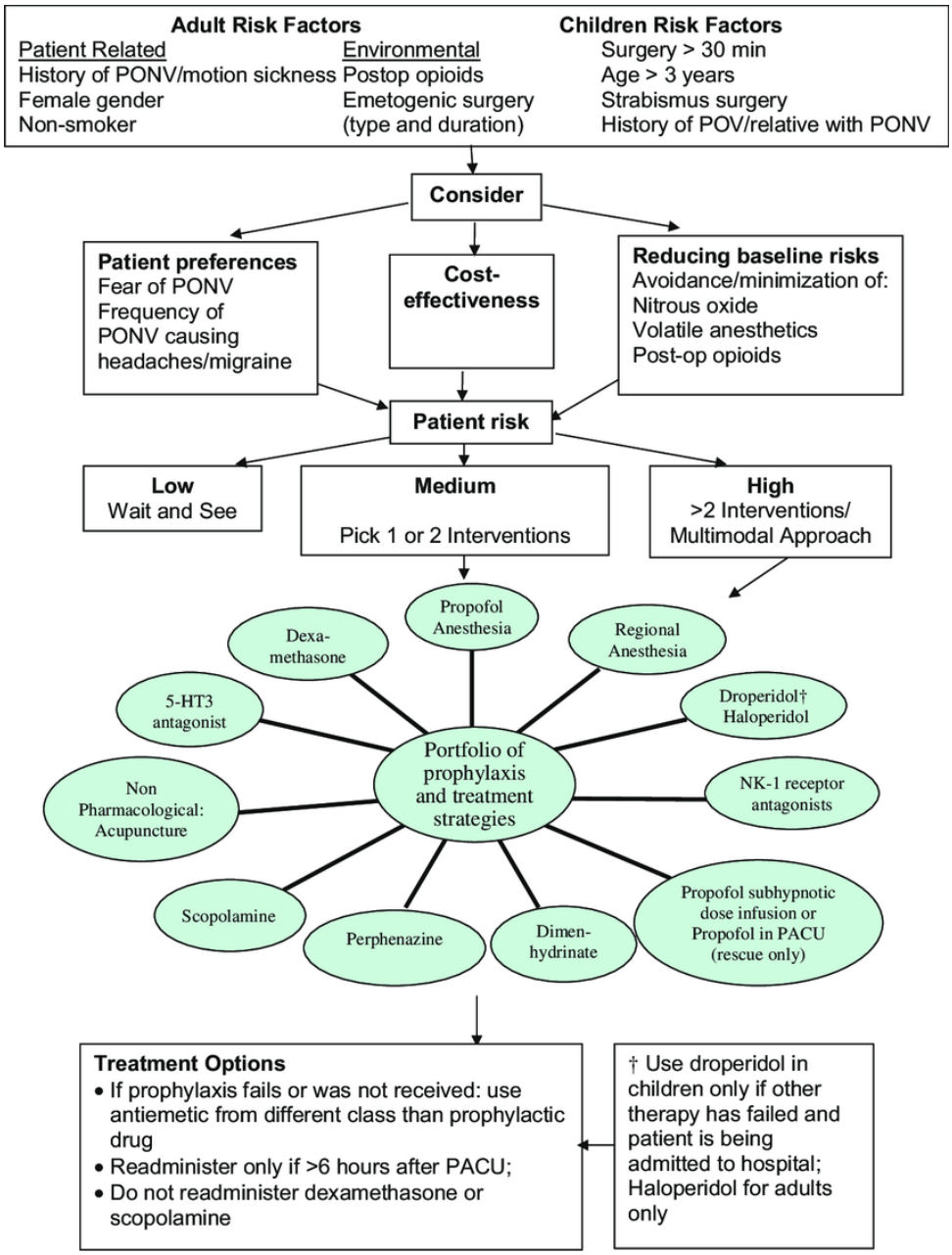
APPENDICES

APPENDIX A -

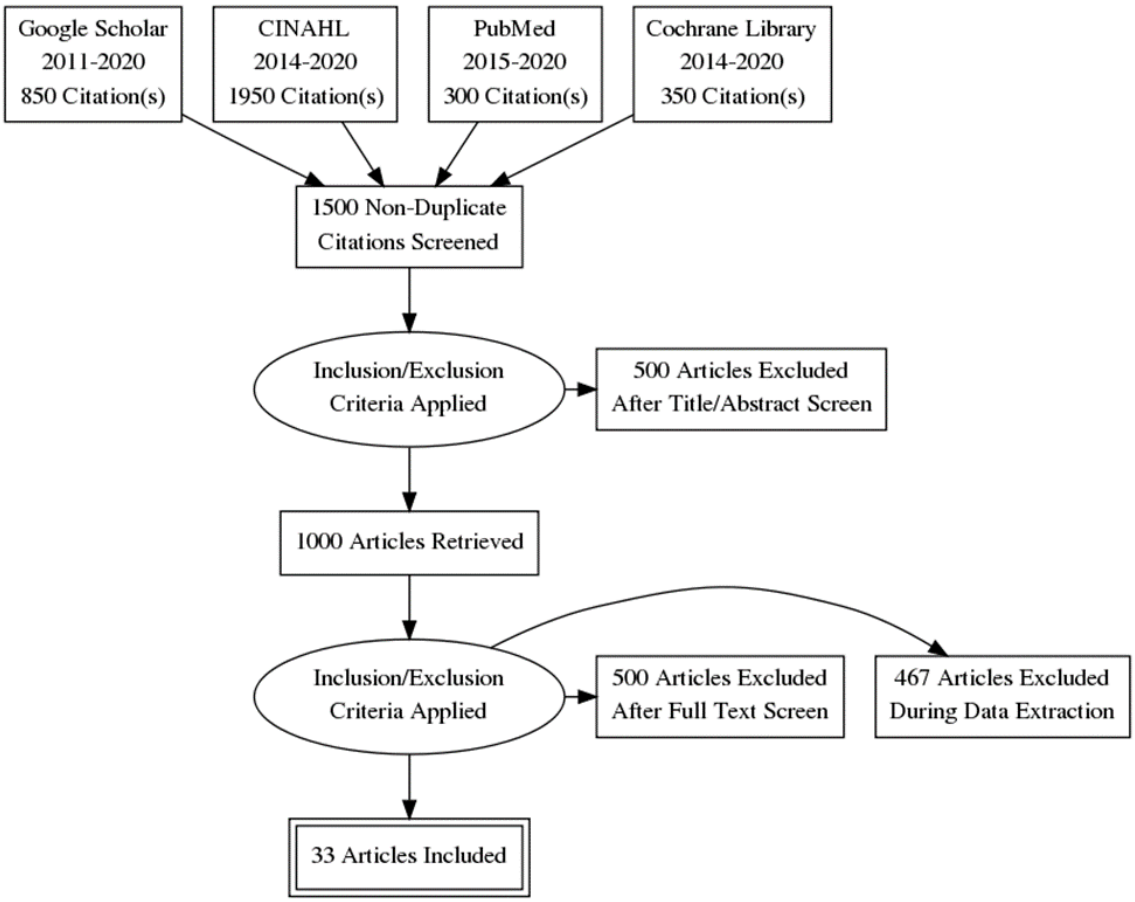
2014 SAMBA Recommendations



Adapted from "Consensus Guidelines for the Management of Postoperative Nausea and Vomiting," by T. J. Gan, P. Diemunsch, A. S. Habib, A. Kovac, P. Kranke, T. A. Meyer, M. Watcha, F. Chung, S. Angus, C. Apfel, S. D. Bergese, K. Candiotti, M. T. V. Chan, P. J. Davis, V. D. Hooper, S. Lagoo-Deenadayalan, P. Myles, G. Nezat, B. K. Philip, and M. R. Tramèr, 2014, Anesthesia & Analgesia, 118(1), p. 91 (https://doi.org/10.1213/ANE.0000000000000002). Copyright 2013 by International Anesthesia Research Society.

APPENDIX B -

Prisma Diagram



APPENDIX C -

Preoperative Apfel Risk Factors Questionnaire

The screening tool questionnaire:

1. Female
2. History of motion sickness or PONV
3. Non-smoker
4. Postoperative opioids

Base prophylaxis on risk score:

Risk Score	Risk of PONV	Risk Factors	Risk Level	Guidelines
0	10%	0–1 Factors	LOW	None or **1** antiemetic agent (Ondansetron or Dexamethasone)
1	20%			
2	40%	1–2 Factors	MEDIUM	**2** antiemetic agents (Ondansetron, Dexamethasone, Famotidine, or TIVA)
3	60%			
4 or more	80%	>2 Factors	HIGH	**3–4** antiemetic prophylaxis (Ondansetron, Dexamethasone, Diphenhydramine, Scopolamine Patch, Famotidine, TIVA, or Metoclopramide)

***Combinations should be with drugs that have different mechanism of action**.

***Consider strategies to reduce PONV baseline risk such as**

- Regional anesthesia instead of general anesthesia
- Adequate hydration
- Propofol for induction and maintenance
- Minimize the use of nitrous oxide and volatile anesthetics

***Do not order an agent for treatment in PACU from the same class as an agent that has been used**

PLEASE DO NOT PLACE INTO PATIENT CHART

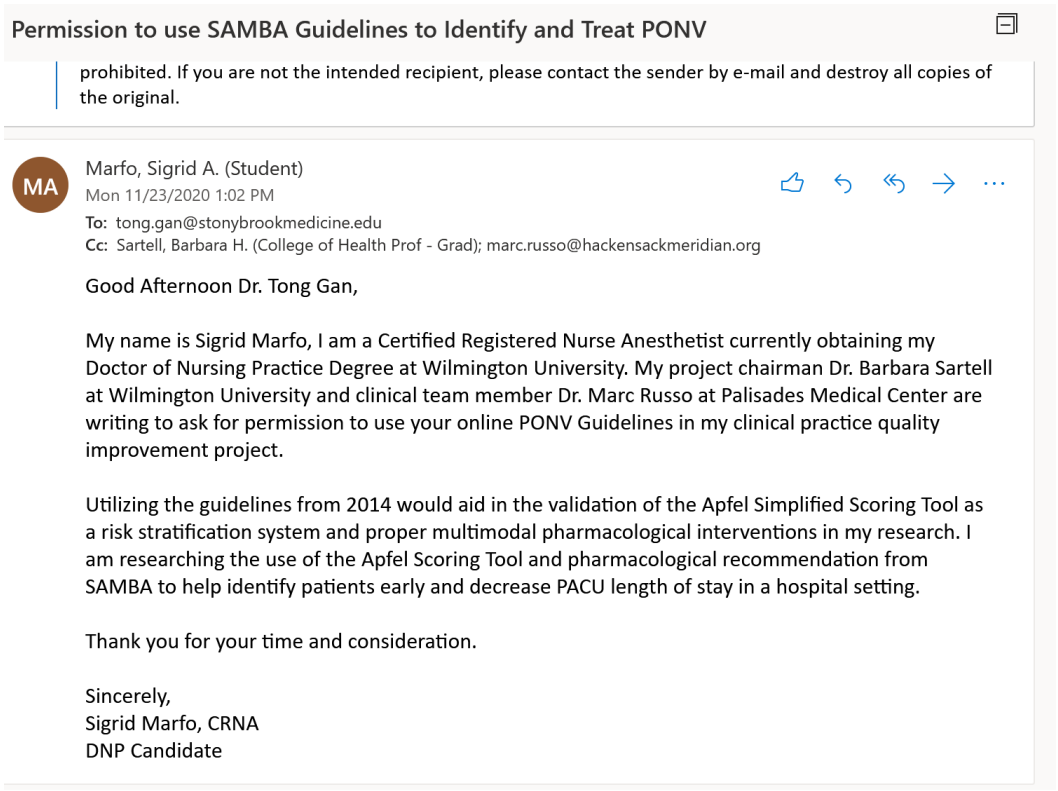
APPENDIX D -

Budget

IMPLEMENTATION OF ASRS AND MPI FOR PONV PROJECTED BUDGET 2021-2023					
Income		**Per /Unit**	**Projected 2021 (400 patients)**	**Projected 2022 (450 patients)**	**Projected 2023 (550 patients)**
PACU Stay	30 minutes	$ 500.00	$ 200,000.00	$ 225,000.00	$ 275,000.00
	1 hour	$ 1,500.00	$ 600,000.00	$ 675,000.00	$ 825,000.00
	2 hour	$ 2,500.00	$ 1,000,000.00	$ 1,125,000.00	$ 1,375,000.00
	TOTAL INCOME	**$ 4,500.00**	**$ 1,800,000.00**	**$ 2,025,000.00**	**$ 2,475,000.00**
Expenses		**Per Unit/hour**	**Projected 2021 (400 patients)**	**Projected 2022 (450 patients)**	**Projected 2023 (550 patients)**
Salaries	Nurse Anesthetist (150 min)	$ 98.00	$ 98,000.00	$ 110,250.00	$ 134,750.00
	Anesthesiologist (150 min)	$ 175.00	$ 175,000.00	$ 196,875.00	$ 240,625.00
	Preoperative RN (60 min)	$ 55.00	$ 22,000.00	$ 24,750.00	$ 30,250.00
	Postoperative RN (90 min)	$ 55.00	$ 33,000.00	$ 37,125.00	$ 45,375.00
	Statistician Analysis (60 min)	$ 35.00	$ 14,000.00	0	0
	TOTAL	**$ 418.00**	**$ 342,000.00**	**$ 369,000.00**	**$ 451,000.00**
		Per /Unit	**Projected 2021 (400 patients)**	**Projected 2022 (450 patients)**	**Projected 2023 (550 patients)**
Validation Tool	Risk Assessment Tool	$ 800.00	$ 800.00	$ 800.00	$ 800.00
Medications	Zofran	$ 2.06	$ 824.00	$ 927.00	$ 1,133.00
	Reglan	$ 10.23	$ 4,092.00	$ 4,603.50	$ 5,626.50
	Scopolamine Patch	$ 99.44	$ 39,776.00	$ 44,748.00	$ 54,692.00
	Famotidine	$ 5.18	$ 2,072.00	$ 2,331.00	$ 2,849.00
	Decadron	$ 1.49	$ 596.00	$ 670.50	$ 819.50
	Normal Saline	$ 8.00	$ 3,200.00	$ 3,600.00	$ 4,400.00
	Promethazine	$ 19.80	$ 7,920.00	$ 8,910.00	$ 10,890.00
	Haloperidol	$ 6.69	$ 2,676.00	$ 3,010.50	$ 3,679.50
	Diphenhydramine	$ 4.48	$ 1,792.00	$ 2,016.00	$ 2,464.00
	Propofol	$ 8.18	$ 3,272.00	$ 3,681.00	$ 4,499.00
	Lactated Ringers	$ 16.00	$ 6,400.00	$ 7,200.00	$ 8,800.00
Equipment	Paper (1 box)	$ 70.00	$ 70.00	0	0
	Ink	$ 60.00	$ 60.00	0	0
	USB Flash Drive	$ 10.00	$ 10.00	0	0
	Microsoft Excel Software	$ 140.00	$ 140.00	0	0
	Lock Box	$ 100.00	$ 100.00	0	0
	TOTAL EXPENSES	**$ 1,361.55**	**$ 73,800.00**	**$ 82,497.50**	**$ 100,652.50**
	OVERALL EXPENSES	**$ 1,779.55**	**$ 415,800.00**	**$ 451,497.50**	**$ 551,652.50**
	PROFIT	**$ 2,720.45**	**$ 1,384,200.00**	**$ 1,573,502.50**	**$ 1,923,347.50**

APPENDIX E -

SAMBA Permission



Permission to use SAMBA Guidelines to Identify and Treat PONV

prohibited. If you are not the intended recipient, please contact the sender by e-mail and destroy all copies of the original.

MA

Marfo, Sigrid A. (Student)
Mon 11/23/2020 1:02 PM

To: tong.gan@stonybrookmedicine.edu
Cc: Sartell, Barbara H. (College of Health Prof - Grad); marc.russo@hackensackmeridian.org

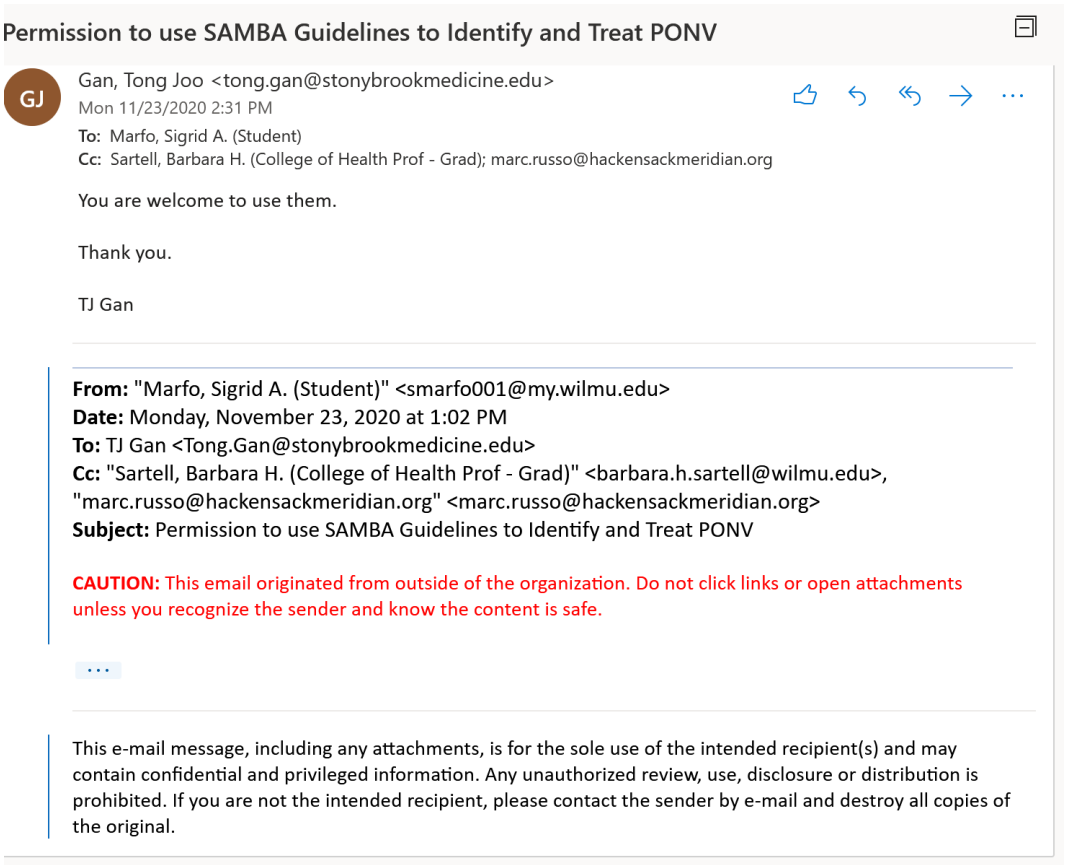
Good Afternoon Dr. Tong Gan,

My name is Sigrid Marfo, I am a Certified Registered Nurse Anesthetist currently obtaining my Doctor of Nursing Practice Degree at Wilmington University. My project chairman Dr. Barbara Sartell at Wilmington University and clinical team member Dr. Marc Russo at Palisades Medical Center are writing to ask for permission to use your online PONV Guidelines in my clinical practice quality improvement project.

Utilizing the guidelines from 2014 would aid in the validation of the Apfel Simplified Scoring Tool as a risk stratification system and proper multimodal pharmacological interventions in my research. I am researching the use of the Apfel Scoring Tool and pharmacological recommendation from SAMBA to help identify patients early and decrease PACU length of stay in a hospital setting.

Thank you for your time and consideration.

Sincerely,
Sigrid Marfo, CRNA
DNP Candidate



Permission to use SAMBA Guidelines to Identify and Treat PONV

GJ

Gan, Tong Joo <tong.gan@stonybrookmedicine.edu>
Mon 11/23/2020 2:31 PM

To: Marfo, Sigrid A. (Student)
Cc: Sartell, Barbara H. (College of Health Prof - Grad); marc.russo@hackensackmeridian.org

You are welcome to use them.

Thank you.

TJ Gan

From: "Marfo, Sigrid A. (Student)" <smarfo001@my.wilmu.edu>
Date: Monday, November 23, 2020 at 1:02 PM
To: TJ Gan <Tong.Gan@stonybrookmedicine.edu>
Cc: "Sartell, Barbara H. (College of Health Prof - Grad)" <barbara.h.sartell@wilmu.edu>, "marc.russo@hackensackmeridian.org" <marc.russo@hackensackmeridian.org>
Subject: Permission to use SAMBA Guidelines to Identify and Treat PONV

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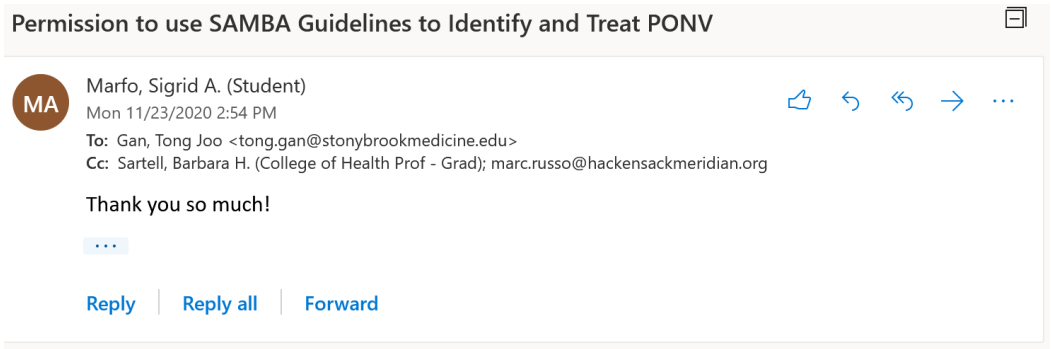

Permission to use SAMBA Guidelines to Identify and Treat PONV

MA

Marfo, Sigrid A. (Student)
Mon 11/23/2020 2:54 PM

To: Gan, Tong Joo <tong.gan@stonybrookmedicine.edu>
Cc: Sartell, Barbara H. (College of Health Prof - Grad); marc.russo@hackensackmeridian.org

Thank you so much!

...

Reply | Reply all | Forward

APPENDIX F -

Hospital Approval

St. Mary's General Hospital

[illegible] Boulevard Passaic, NJ 07055 973-365-4548 [illegible]

March 23, 2021

To: Sigrid Marfo, CRNA, MSN, APN

From: CNO- Karin Stalter, RN, MSN, CNL, OCN
St. Mary's General Hospital

Project Title:
Development and Evaluation of a Quality Improvement Initiative to Reduce Postoperative Nausea and Vomiting

This is a formal letter of approval to conduct your quality improvement project at St. Mary's General Hospital. The Institutional Review Board approval is not needed.

We will put a copy of this correspondence on file in our office.

Karin Stalter, RN, MSN, CNL, OCN

APPENDIX G -

Human Subjects Research Application

APPENDIX H -

CITI Program