

Utilization of an Outpatient Nausea Prevention Protocol

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By

Melody A. Betts, CRNA, MSN

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Committee:

Gerene Bauldoff, PhD, RN, FAAN

Jacqueline Loversidge, PhD, RN

Janine Overcash, PhD, RN

Abstract

Project Purpose: The purpose of this project was to determine the utilization of an evidence-based preventative postoperative nausea and vomiting (PONV) protocol in the outpatient surgical population of a large health system within the Midwest.

Project Design: This was a retrospective descriptive quality project of a limited number of anesthetic records to determine the degree of utilization of a previously designed PONV protocol.

Setting: The process evaluation project was conducted at a large urban community hospital

Sample: The sample was a convenience sample of de-identified anesthesia records of outpatient surgical patients over a 14 day time period.

Measures: A utilization collection tool was used to assess the implementation of the PONV protocol. This tool gathered data on patient demographics of gender, weight, opioid usage, smoking status and risk score assessment from the anesthetic record. The use of the protocol itself was evaluated by examining data from the anesthetic record with regards to several variables. Variables examined included the administration of ondansetron, dexamethasone, ketorolac, target intravenous fluid replacement therapy, and neuromuscular reversal agents. The option of total intravenous anesthesia and the use of nitrous oxide intraoperatively were also documented.

Results: The sample included 269 surgical outpatients (93 females/176 males, age 19-93 (mean 52.43 years). History of PONV was low at 6.3%. Risk score was documented in 136 (50.4%). Of recorded scores, 92.6% were accurately calculated. No risk score was documented in 133 patients (49.4%). Of these, 51 (38.3%) did not attend preoperative assessment (PAT) prior to day of surgery. Of the 133 patients who were seen for PAT, 51 (38.3%) did not have a

documented risk score as part of the PAT. There were 82 (30.5%) patients not seen until day of surgery. Per protocol, 88.5% of patients received ondansetron with 59% dosed within the 30-minute recommended window. Dexamethasone, for patients with an Apfel risk score ≥ 2 , was given in 113 (41.9%) of the sample. Appropriate fluid therapy (10-15mg/kg) was administered in 148 (54.8%) of patients while 100 (37%) did not receive the recommended fluid administration. An additional 20 patients were precluded from the target fluid administration due to end-stage renal disease or did not have a total IV fluid documentation. Only eight (3%) patients received Emend, a Neurokinin-1 inhibitor known to be highly effective in prevention of PONV. Out of the 111 cases requiring reversal of neuromuscular blocking agents, 12 (10.8%) received full reversal of Neostigmine 5mg while 98 (89%) received less than 5mg.

Conclusions: Our sample demonstrated that there continues to be a lack of consistency in the prevention of PONV even when practitioners are provided evidence based information and guidelines. The implementation of various therapies to decrease the incidence of PONV showed some progress from when the literature search began. Patients are now routinely receiving ondansetron. Based on Rogers (2003), early adopters have integrated the PONV protocol into practice. It is clear that didactic presentation alone is inadequate to effect consistent sustainable change.

Implications for Practice: Continued development, testing and refinement of educational strategies to promote integration of the PONV protocol into perioperative practice are indicated.

Utilization of an Outpatient Nausea Prevention Protocol

Chapter 1: Introduction

The incidence of ambulatory surgery in the United States has increased exponentially since the 1980's largely due to advances in both surgical and pharmacological technology as well as concerns about inpatient costs and reimbursement from insurance. The development of anesthetic medications with shorter half-lives has decreased the time required for recovery from anesthesia. The widespread use of laparoscopy has also allowed many previous "open" procedures requiring hospitalization to be accomplished with minimally invasive techniques. Minimally invasive techniques decrease pain and shorten the recovery process allowing many patients to be discharged the same day.

With the implementation of the Affordable Care Act (ACA), the structure of healthcare provision within the United States has entered a state of evolution (Graham & Graham, 2011). Medicare reimbursement is shifting from a fee-for-service plan to a value-based reimbursement system with demands on documentable standard patient outcomes and satisfaction scores (Patterson, 2011). In this atmosphere, there is a growing demand to provide excellent care based on evidence-based practices while concurrently streamlining patient flow through the system in a cost effective manner. Providing a cost effective high quality outpatient surgical experience is the goal of an evidence-based outpatient anesthetic plan of care.

The Problem

The discovery of anesthesia for surgical procedures in 1846 along with the acceptance of the need for asepsis allowed the development of surgery as a specialty worldwide (Tounsend, Beauchamp, Evers, & Mattox, 2012). In the early 19th century, operative procedures were risky and undertaken only in cases of necessity because of the increased morbidity and mortality

associated with anesthesia, infection and the procedure itself (Bankert, 1993). Even until the 1970's, the majority of these surgical procedures were accomplished within the confines of the hospital setting and resulted in admission to the facility (Bankert, 1993; Cullen, Hall, & Golosinskiy, 2009).

Concerns about escalating healthcare costs with Medicare reimbursement in the 1980's encouraged the development of ambulatory surgery centers and departments in the United States (Cullen, Hall, & Golosinskiy, 2009). Ambulatory surgery is defined as "any surgical procedure performed on the same day a patient is admitted and released from a facility" (Senathirajah, Preti, & Sun, 2009). In the United States, outpatient surgeries are accomplished at three main venues including the hospital, free standing independent surgical center and hospital-owned surgical centers (Senathirajah, Preti, & Sun, 2009). As insurance providers began to reimburse outpatient centers, the number of these facilities increased from 239 in 1983 to 3,300 by 2003. Outpatient surgical procedures increased from 380,000 in 1983 to 31.5 million by 1996 (Cullen, Hall, & Golosinskiy, 2009). By allowing patients to bypass a hospital admission, billions of dollars were saved by Medicare and private insurances. In 2006 alone, 56.4 million operative procedures were done in the United States per year with 34.7 million of them accomplished on an outpatient basis. This translates to roughly 61.5% of all surgeries done on an outpatient basis across all age groups (Cullen, Hall, & Golosinskiy, 2009).

Postoperative nausea and vomiting (PONV) along with pain remain the two most distressing and common complications of outpatient surgical procedures (Rusch, Eberhart, Wallenborn, & Kranke, 2010). PONV, as a complication of anesthesia has existed since the discovery of anesthesia in the late 1800's. Treatments and theories of the causes of this phenomenon began to be published in the literature with the first issue of *Anesthesia and*

Analgesia in 1922 (Habib, Gan, Defries, Habib, & Gan, 2012). Historically, general anesthesia was provided by mask and the patient's airway was unprotected from gastric contents as protective reflexes were lost. This resulted in PONV being a potential fatal risk of surgery through aspiration of gastric contents intraoperatively and resultant pneumonia (Nagelhout, 2013). The development of the cuffed endotracheal tube in the 1930's reduced the risk of aspiration and death intraoperatively; subsequently PONV evolved into a patient satisfaction and hospital resource management concern and less of a morbidity/mortality risk (Habib, et al., 2012).

PONV has been labeled the "big little problem" which clinicians must address in their goal to improve patient outcomes and surgical processes (Kovac, 2000). PONV delays discharge, leads to possible hospital admission (at increased cost), exacerbates post-operative pain and increases the risk of post procedure aspiration and/or surgical dehiscence (Kapoor, Hola, Adamson, & Mathis, 2008). It is also the most common cited cause of patient dissatisfaction (Myles, Williams, Hendrata, Anderson, & Weeks, 2000). Prolonged episodes of PONV can negatively impact patient outcomes by exposing them to the risk of esophageal rupture, wound dehiscence, aspiration, and postoperative bleeding from retching (Miaskowski, 2009).

For these reasons, postoperative nausea prevention for both outpatients and inpatients remains of great concern to the anesthesia provider. In the meta-analysis of treatment regimes for PONV by Figueredo and Canosa (1999), the incidence of PONV in patients in the placebo groups who received no prophylaxis for PONV was 67.7%. Patients who received some form of PONV prevention had an incidence of 46%. And even with maximum efforts to prevent PONV utilizing multimodal interventions, 0.2% of patients developed intractable nausea and vomiting requiring unanticipated admission (Figueredo & Canosa, 1999). Patients rate symptoms of PONV among

the most unpleasant experiences associated with surgery. Many have significant anticipatory anxiety about developing this complication (Myles, Williams, Hendrata, Anderson, & Weeks, 2000). PONV is so unpleasant and undesirable to patients that in a study by Gan and colleagues (2001), it was found that if a hypothetical drug was available to the participants, which would insure zero PONV, the average patient was willing to pay US\$56 out of pocket (Gan, Sloan, Dear Gde, El-Moalem, & Lubarsky, 2001). Patients who were experiencing nausea were willing to pay US\$73 and those who had experienced emesis were willing to pay on average US\$100. This indicates that from the patient's perspective, PONV is a significant concern.

The occurrence of PONV for the healthcare organization impacts the care of the outpatient surgical patient. Patients must meet discharge criteria from the Same Day Surgical Suite and cannot be discharged in pain or with PONV. Aside from the physical and emotional impact on the patient, the economic impact to the health care delivery system is significant in that a single episode of PONV adds an average of 25 minutes to the postanesthesia care unit stay (PACU) (Chatterjee, Rudra, & Sengupta, 2011). PACU fees can cost from US\$60-\$180/ 15 minute increments depending on patient acuity. With 60% of surgical cases being done on an outpatient basis, this represents a significant financial impact if 40/100 people per day are delayed in their discharge due to PONV. In fact, the annual national cost of PONV is estimated at several hundred million (Apfel et al., 2004a).

The development, implementation and evaluation of a standardized treatment plan based on evidenced based practice in the adult outpatient surgical patient population is the focus of this author's doctoral studies. The goal is to improve patient outcomes through a coordinated effort to prevent this complication during the outpatient surgical experience.

Purpose of the Project

The purpose of this project was to describe the utilization an evidence-based preventative postoperative nausea and vomiting protocol among surgical outpatients (Appendix A). The PONV protocol was developed based on a review of meta-analysis, random controlled trials and current best practices recommendations with the goal of patient care improvement through evidence-based practice. Improving the safety and quality of the outpatient experience for the surgical patient is the overall goal in this project. The author considers this a first step in evaluating any potential impact of a uniform evidence-based plan to decrease PONV in all surgical patients.

Significance of the Project

The development of the PONV protocol was designed to address the issue of fragmented and inconsistent treatment/prophylaxis for PONV among anesthesia providers at the author's institution. This project will be the first step in evaluating the usefulness of this protocol by describing the usage by providers in the clinical setting. The design, implementation and evaluation of quality-improvement methodologies for the promotion of improved patient care is a component of the DNP Essential of Advanced Nursing Practice which focuses on clinical scholarship for APRNs (Chism, 2010). The project will describe the implementation of the protocol among outpatient surgical patients. For the author, this pilot project is the first step in examining the impact of the implementation of this program to decrease the overall incidence of PONV in all surgical patients.

The development of the doctorate of nursing practice was implemented to address this disconnect between research and clinical practice. Doctorate education enables advanced practice nurses in many specialties to have the knowledge and ability to review a wide variety of

evidence including meta-analysis studies, RCTs and qualitative research. The American Association of Colleges of Nursing (AACN) established the professional essentials or standards for this degree in 2004 and unified the title as doctorate of nursing practice (American Association of Colleges of Nursing, 2004). The AACN identifies eight components of doctoral education for APRNs, which they identify as Essentials for the degree. The goal of doctoral preparation of APRNs is to accelerate the translation of knowledge from research to clinical practice through the education of those who are in clinical practice and who may hold key leadership roles within the healthcare organization (Brown & Crabtree, 2013). The overall goal of all APRNs is improvement in patient care, outcomes and satisfaction.

The project will also address the Essential of Clinical Scholarship and Analytical Methods for Evidence-Based Practice (American Association of Colleges of Nursing, 2004). From a strategic organizational planning perspective, it is essential to develop patient care strategies, which are efficacious and cost effective in today's reduced reimbursement state. As healthcare organizations move into this changing environment, those who survive will most likely need to adapt their culture to pursue cost effective evidence based practices in order to maintain solvency. This project will be the initial venture in the author's anesthesia department in providing literature supported anesthetic care to promote best outcomes within our patient population.

Project Objectives

The major goal of this project was to decrease the incidence of postoperative nausea and vomiting through an evidence-based multimodal preventative approach in surgical outpatients. The objectives were: (1) to conduct an extensive comprehensive review of the literature and develop a protocol based on quality evidence; (2) to implement this protocol through staff in-

service education; (3) to describe the incidence of compliance by anesthesia providers in implementing the protocol.

The PICOT question for this DNP project was: In selected anesthesia providers, does an evidence-based multimodal preventative postoperative nausea and vomiting protocol impact adoption of evidence-based practice for surgical outpatients?

Chapter 2: Review of Literature

Conceptual Framework

An organization is defined by Rogers (Rogers, 2003) as a “stable system of individuals who work together to achieve common goals through a hierarchy of ranks and a division of labor” (p.408). His theory of diffusion of innovation was developed based on his childhood observation of the adoption of hybrid disease resistant corn in Iowa in the 1940’s (Rogers, 2003). He addressed the diffusion of innovations both at an individual level and organizational/large group level. Large healthcare organizations such as hospitals tend to be very hierarchical organizations. As such communication of ideas and diffusion of new innovations tend to be dependent upon the individual leadership characteristics and the internal/external characteristics of the organization (Rogers, 2003). Rogers identifies innovative change within an organization as a decision making process which encompasses several stages. Rogers (2003) identifies the first step in the change process as the exposure of individuals to an innovation. Rogers (2003) terms this the knowledge stage. With regards to the PONV protocol, the author prepared the evidence based recommendations, had them peer reviewed and then presented the recommendations at the staff weekly in-service as a power point presentation. Providers had the opportunity to comment and ask further questions regarding the literature review and didactic information.

Rogers categorizes the individuals’ response to innovation within the organization into several subsets. Within organizations there are innovators themselves, early adopters, early majority adopters, late majority adopters and laggards (Rogers, 2003). Innovators tend to be individuals who perceive a need and seek out new knowledge to meet that need. DNP APRNs are ideally positioned to become these change agents because of their current clinical practice and advanced education in evaluation of evidence within the literature. As innovators, the DNP

role is to support and facilitate early adopters in embracing change and experimenting with innovation. Identifying and supporting these early adopters or key supporters is essential because of their potential positive influence on those around them to embrace change (Kulier, Gee, & Khan, 2008). Adoption of innovation usually falls around a bell shaped curve with roughly half of the adoptees falling into the late adopters and laggard categories. These individuals tend to be skeptical of change or committed to their traditional methods (Rogers, 2003). These individuals may refuse to change unless mandated to do so.

Persuasion is the second phase of Rogers's theory on innovation (Rogers, 2003). This encompasses the phase in which individuals form some sort of opinion about the new innovation. This is likely the phase where the innovation is accepted by both the early and late majority of people based on the innovation's user friendliness, perceived significance, and amount of effort the staff must exert to use the innovative process (Hewitt-Taylor, 2013). Allowing staff to provide feedback encourages buy-in by members of the team (Kulier, Gee, & Khan, 2008).

Making a decision to adopt or reject the innovation is the next phase of organizational change. If the change is perceived as helpful and valuable by the majority of individuals and is supported by management, then sustainable change may likely occur (Ginter, Duncan, & Swayne, 2013). Rogers (2003), identifies a point in the innovative process in which a "critical mass" of supporters have adopted the change and make the sustainability of the innovation more likely. Support of the PONV protocol from both the physician leadership and early adopters has been essential to the goal of achieving this critical mass of adoptees.

Rogers identifies implementation, or the actual putting to use of the innovation, as the last phase of the change process (Rogers, 2003). The inclusion of the PONV score within the anesthetic preoperative assessment and inclusion of the PONV protocol on the anesthetic plan as

part of the patient's record has been a two-year endeavor on the part of the author and several physicians. The goal is for this new practice change to become institutionalized and accepted by all anesthesia providers. The DNP project will describe to what degree this process is occurring.

The concept of re-invention, or the adaptation of the innovation to the individual organization to provide a better fit is essential to the success of the long-term longevity of the PONV protocol (Rogers, 2003). The protocol described here was designed for the author's institution from a review of the available evidence. It is recognized that as the body of research moves forward the components of the protocol may need to be revised based on new evidence. This future work is supported by Rogers' recognition of the need for re-invention as time progresses in the diffusion process with later adoptees profiting from the experiences of earlier adoptees (Rogers, 2003). This process of re-invention allows for the dynamic state of research to be incorporated into the PONV protocol as new best practice recommendations evolve.

PONV Literature Review

Risk Factors

Significant effort has been expended to find the cause and cure for post-operative nausea and vomiting. At its most basic physiologic level, PONV may be the result of a genetic predisposition to respond to certain stimuli with nausea. Four major risk factors have been identified for PONV (Apfel, Philip et al., 2012). Of the four risk factors, two have been identified as genetic in origin.

Motion Sickness

The first is a history of motion sickness, which has been found to be a predictor of increased risk for PONV. There is a three-fold increase in incidence of patients who have had a history of motion sickness or previous episode of PONV (Kovac, 2000). Research into the genomic

contribution to the development of motion sickness in humans has found the functions of aquaporins (AQP1) within the inner ear to be a contributing risk factor for the development of motion sickness (Huang, Xia, Dai, & Han, 2011). This variation in genetic makeup between people may provide some explanation as to why some cannot tolerate amusement or motor vehicle rides. Support for a genetic component was also found by Reavley and colleagues (Reavley, Golding, Cherkas, Spector, & MacGregor, 2006) who discovered a statistically significant relationship in the prevalence of motion sickness among identical twin sets who experienced motion sickness. In comparison, non-identical twin sets did not demonstrate a significant relationship between the tendency for motion sickness with their twin sibling.

Gender

The second genetic risk factor is gender. Female gender is associated with a two to three times greater risk for PONV than males. The reasons for this remain unclear. Some studies suggest changing gonadotropin, estrogen, and plasma progesterone levels during the monthly cycle affecting PONV by an unknown mechanism (Beattie, Lindblad, Buckley, & Forrest, 1991). Conflicting studies exist regarding the relationship of PONV to the menstrual cycle. Elderly patients have the lowest incidence of PONV in both males and females so the lack of estrogen cannot be the only contributing factor (Apfel et al., 2003). Females have significantly more ambulatory surgical procedures than males (30.6 million vs. 22.7 million 2008) so their increased statistical presence may have some impact on these numbers (Cullen, Hall, & Golosinskiy, 2009).

Smoking

While non-smoking decreases morbidity risk for anesthesia, it increases the risk for PONV. The incidence is roughly twice that of smokers (Cohen, Duncan, DeBoer, & Tweed,

1994). The exact mechanism for this phenomenon is not fully understood. Smokers as a group are chronically exposed to polycyclic aromatic hydrocarbons. It is theorized that the chronic metabolism of these chemicals causes microsomal liver enzymes to increase (Apfel, Heidrich et al., 2012). Microsomal liver enzymes are responsible for the metabolism of many chemicals in the human and chronic exposure to substances such as aromatic hydrocarbons, alcohol, opioids and many other drugs result in a compensatory increase in the body's ability to process them (Nagelhout, 2013). This may result in an efficient processing of not only chronic smoke inhalants but also all other chemicals such as anesthetic agents and opioids. The result is that the patient experiences a shorter total exposure time to anesthetic agents/opioids potentially decreasing their risk to develop PONV (Apfel, Heidrich et al., 2012). Other theories point to the acute withdrawal of nicotine as being protective for PONV (Apfel, Heidrich et al., 2012). It is hypothesized that smoking chronically exposes neuroreceptors to nicotine. Thus, the abrupt cessation of nicotine exposure in the perioperative phase may decrease their susceptibility to PONV (Apfel, Heidrich et al., 2012).

Opioid Exposure

Opioid exposure is virtually universal in the hospital setting with the exception of some endoscopic procedures and cataract surgery. Opioids are given as part of the induction process to blunt the sympathetic response to intubation with an endotracheal tube and to decrease postoperative pain (Morgan, Edward, Mikhail, Maged, Murray, & Michael, 2006). The total dosage of opioids is of more relevance than type. Fentanyl dosages greater than 125 mcg. are associated with increased risk (Chatterjee, Rudra, & Sengupta, 2011). Opioids contribute to the development of nausea by three mechanisms. First, they stimulate the chemoreceptor trigger zone in the brain activating the emetic center via the release of dopamine and serotonin.

Secondly, they decrease gastrointestinal motility. And lastly, they sensitize the inner ear to movement, which acts on the medullary pathway in the brain to stimulate nausea and vomiting (Miaskowski, 2009).

Apfel has identified these factors as the main contributors to the risk for PONV. He went on to develop a validated risk assessment scoring system based on these key points (Apfel, Laara, Koivuranta, Greim, & Roewer, 1999). Each of these main contributors is assigned one point in the preoperative assessment. He documented that a score of zero to four corresponded with an incremental increased PONV risk of 10%, 21%, 39%, 61% and 79% respectively (Apfel, Laara, Koivuranta, Greim, & Roewer, 1999). This risk screening can be accomplished in the preoperative testing phase or any point pre-surgical experience allowing for a prophylactic plan to be initiated based on risk score.

Other Factors

Other risk factors influencing outcomes are length of surgery, increased preoperative anxiety, postoperative pain and the type of surgical procedure (Kovac, 2013). Procedures lasting longer than two hours are known to increase one's risk for PONV due to increased anesthetic inhalation agent and opioid exposure (Apfel, Stoecklein, & Lipfert, 2005). Increased preoperative anxiety, along with increased postoperative pain influence PONV through sympathetic nervous system stimulation, which slows gastric motility (Chandrakantan & Glass, 2011). Procedures that involve insufflation of the abdominal cavity (laparoscopy of any kind) disrupt the gastrointestinal tract and subsequently result in the release of serotonin and stimulation of the vagus nerve (Collins, 2011). Finally, operative procedures that involve the ear, eye, nose, throat, or gynecological, obstetrical and abdominal procedures are also highly emetogenic (Collins, 2011).

The patient's age affects their relative risk for PONV. The current rate for PONV across the lifeline is 22-30% (Chandrakantan & Glass, 2011). Pediatric patients experience the greatest incidence of nausea and vomiting. Incidence decreases with the onset of puberty (34% among pediatric patients) and continues to decrease with the lowest rate amongst the elderly (Stadler, Bardiau, Seidel, Albert, & Boogaerts, 2003).

The patient's hydration status profoundly influences their risk for PONV. Many patients enter the healthcare system profoundly dehydrated due to chronic illness, fasting, diuretic therapy, and/or bowel preps. Traditionally, patients were advised to remain "non par os" after midnight due to the risk of aspiration of gastric contents on induction of anesthesia (Smith et al., 2011). The establishment of the value of hydration in prevention of PONV and even later post discharge nausea and vomiting along with new research into the safety of clear liquids up to two hours preoperatively has led to a relaxation of these previously widely held standards (Smith et al., 2011). Adequate and even assertive rehydration of the patient intra-operatively with intravenous fluids (10-25 ml/kg if tolerated) is the only factor which has been shown to impact post discharge nausea and vomiting to any significant degree (Apfel, Meyer, Orhan-Sungur, Jalota, Whelan, & Jukar-Rao, 2012).

Anesthetic technique can influence the risk for PONV. All inhalation agents currently on the market (Forane, Sevoforane and Desfluane) increase the risk of PONV equally (Wallenborn, Gelbrich, & Kaisers, 2011) and that risk increases with the amount of time exposed (Macario, Dexter, & Lubarsky, 2005). This effect is especially present in the first two to six hours postoperatively (Apfel et al., 2002).

Inhalational or volatile agents are routinely administered once an endotracheal tube is placed to maintain a surgical plane of anesthesia in a general anesthetic. Concurrently, these

inhalation agents are carried to the patient by carrier gasses such as oxygen, air, nitrous oxide or a combination of oxygen/air or oxygen/nitrous oxide. Nitrous oxide, or “laughing gas,” is a weak inhalation agent, which can be used to decrease the amount of other agents used to provide anesthesia (Morgan, et al., 2006). The use of nitrous oxide increases the risk for PONV by 20% by directly stimulating the vomiting center and expanding the gas volume within the gastrointestinal tract by up to 100% in as little as two hours (Kovac, 2013). The distension of the intestine by nitrous administration causes the release of serotonin, a known emetogenic neurotransmitter (Collins, 2011).

The administration of neuromuscular blocking agent reversal at full dose can also be responsible for increased PONV risk due to its action on the muscarinic receptors (Morgan, et al., 2006). Muscarinic receptor activation is associated with increased risk for nausea and vomiting (Morgan, et al., 2006). The reversal of neuromuscular blocking agents is frequently required at the end of a general anesthetic to variable degrees. Recent meta-analysis studies have indicated that high dose neostigmine (>2.5 mg) was associated with increased PONV (Gan et al., 2014). The recommended full reversal dosage in adults > 58 kg is 5 mg. (Morgan, et al., 2006).

In addition, hypotension, which may occur in the intraoperative period due to medication administration or blood loss, also increases the risk of PONV (Chatterjee, Rudra, & Sengupta, 2011). The resultant decreased perfusion to the gastrointestinal system further slows motility and predisposes the patient to increased risk (Collins, 2011).

The choice of induction agents such as propofol and etomidate impacts the development of PONV. Sodium pentothal, no longer widely available, carried with it a markedly increased risk for PONV. Etomidate does not adversely affect the vital signs but causes nausea and vomiting even more than sodium pentothal (Fleisher, 2004). Propofol itself has antinausea

properties and is widely used for its short half-life and smooth induction capabilities. These antiemetic properties last for up to 30 minutes after administration (Apfel et al., 2004). The use of propofol decreases the patient's risk for PONV by 31% on average (Apfel et al., 2004). Unfortunately, Propofol can cause a precipitous drop in blood pressure in the elderly or critically ill patients (Morgan, et al., 2006).

In summary, the PONV risk factors are associated with many surgical procedures and are numerous and multifocal. Risk factors are complex, often the result of many interactional factors, which are beyond the control of the patient or the anesthetic provider. In their meta-review of the literature, Gan and colleagues (2014) identified the most likely cause of PONV as volatile anesthetics, nitrous oxide and postoperative opioids. Addressing all of the known anesthetic contributors can decrease the risk by up to 70% (Apfel et al., 2004b). The focus of this DNP project was to address these risk factors through an evidence-based plan of prophylaxis.

Physiological Development of Nausea and Vomiting

The physiological expression of PONV involves many organ system including the neurological cardiovascular, gastrointestinal and musculature of the abdomen. The process of developing nausea is mediated neurologically by an area extending throughout the medulla oblongata within the lateral reticular formation in the brainstem (Christofaki & Papaioannou, 2014). Input from higher cortical centers (visual, smell, auditory), cerebellar input (movement), vestibular apparatus and vagal/glossopharyngeal nerve stimulation also provide data to the vomiting center (Collins, 2011). Within the floor of the fourth ventricle of the brain outside the blood brain barrier, there exists a chemoreceptor trigger zone (CTZ). This area allows contact between the cerebral spinal fluid and blood providing opportunity for interaction between the

central nervous system and intravascular medications. Histamine, serotonin, cholinergic, Neurokinin-1 and Dopamine (D2) receptor sites within the CTZ provide multiple input sites that initiate the process of nausea and ultimately vomiting (Collins, 2011).

Evidence-based Multimodal Preventative Therapies

Several previously practiced therapies have been discarded as ineffectual in the prevention of nausea and vomiting. Systematic reviews of RCTs have found that high-inspired oxygen concentration in the perioperative phase has no effect on PONV (Orhan-Sungur, Kranke, Sessler, & Apfel, 2008). Attempts to decrease gastric contents through preoperative fasting as well as emptying the stomach via gastric tube have also proven ineffective (Gan, 2006; Kerger et al., 2009). Other therapies, which have been disproven, include music therapy, isopropyl alcohol inhalation, intraoperative omeprazole, cannabis usage, nicotine patch to non-smokers and ginger (Gan et al., 2014). Hopes for the usage of acupuncture stimulus of the P6 point has also been found ineffective in a recent meta-analysis review of RCTs for PONV prevention (Gan et al., 2014). Meclopramide, historically administered to promote gastric emptying as a means to prevent PONV, has also been found to be ineffective (Henzi, Walder, & Tramer, 1999).

The pharmacologic treatment of PONV in a multimodal fashion has been shown to provide the best intervention for the prevention of PONV. While monotherapy can be effective in low risk patients, the combination of agents have been shown to have additive effects due to their different mechanisms of action (Apfel et al., 2003). The addition of each additional medication reduces the risk by 26% (Apfel et al., 2003). The development of the PONV protocol was based on the following best practices recommendations.

Ondansetron. The most commonly used anti-emetic currently is ondansetron, which is a 5-HT₃-receptor antagonist. Ondansetron competitively binds at the serotonin receptor to

decrease vomiting more than nausea (Figueredo & Canosa, 1999). The recommended dosage for ondansetron is 4 mg. within 30 minutes of emergence from anesthesia (Figueredo & Canosa, 1999). The most serious side effect of this medication is QT prolongation on the electrocardiogram, most likely seen with doses higher than 16mg. Dosages higher than 16 mg. are contraindicated due to increased risk for ventricular tachycardia (previously used with chemotherapy) (Kovac, 2000).

Dexamethasone. Dexamethasone 4-8 mg. is comparably effective in preventing PONV (Kovac, 2013). Its mechanism of action is unknown in this capacity. Several mechanisms have been suggested including the inhibition of serotonin centrally and peripherally as well as inhibition of the synthesis of prostaglandins in the inflammatory response (Holte & Kehlet, 2002). Impaired wound healing is a common adverse effect of steroids administered in therapeutic doses (Fauci et al., 2008). RCTs examining the effect of single dose dexamethasone 4-8 mg administration have not demonstrated any adverse effects on wound healing in the surgical patient (Fleisher, 2004). Because steroids elevate serum glucose both in diabetics and non-diabetics, the use of dexamethasone is contraindicated in patients who are diabetic (Gan et al., 2014). In a meta-analysis reviews of RCTs, the use of dexamethasone 4mg at the beginning of the anesthetic and ondansetron at the end of the procedure for nausea prevention appears to be the most effective consistent pharmacologic base level intervention currently in use (Fleisher, 2004). Both ondansetron and dexamethasone are available in generic form and are low cost interventions that are available readily in most institutions.

Aprepitant. The use of Aprepitant, a Neurokinin-1 receptor blocker is usually reserved for those patients who have a consistent history of PONV after anesthesia/surgery. It acts on the final common pathway from the emetic center. Its effects last for 48 hours, making it the only

medication to cover both PONV and post discharge nausea and vomiting (Apfel, Malhotra, & Leslie, 2008). Aprepitant's nausea prevention success rate is 90% for the first 24 hours; it continues to reduce nausea for 48 hours (Apfel, Malhotra, & Leslie, 2008). A single dose of 40 mg is around US\$80 making it cost prohibitive for routine patient use. In the author's PONV protocol, Aprepitant is reserved for patients who have all four risk factors and strong previous history of consistent experiences with PONV. It is most effective when taken two hours preoperatively (Apfel, Malhotra, & Leslie, 2008), and can be administered when the patient first arrives at the hospital to avoid out-of-pocket expense for the patient.

Supplemental intravenous fluids. In their meta-review of the effect of intravenous crystalloids on PONV, Apfel et al. (2012), described adequate rehydration of the patient via intravenous fluids as the only therapy, which has been shown to decrease not only PONV but the secondary phenomena of post discharge nausea and vomiting (Apfel, Meyer, Orhan-Sungur, Jalota, Whelan, & Jukar-Rao, 2012). The mechanism of this action is unknown but may be related to cerebral and intestinal hypo-perfusion and release of antidiuretic hormone (arginine vasopressin or AVP) from the posterior pituitary (Apfel, et.al. 2012). AVP is a known emetogenic substance. Elevated levels of AVP are found in patients who are experiencing PONV and motion sickness as well as patients experiencing nausea and vomiting after opioids (Apfel, et.al., 2012). Their review of RCTs also found that intravenous hydration had no effect on the treatment of vomiting only in the prevention of nausea.

Adjunct pain therapy. Opioids activate the CTZ directly by increasing the release of serotonin. Opioids also decrease gastric motility, sensitize the otic and vestibular areas to movement and stimulate central nervous system opioid receptors (Kovac, 2000). Adjunct therapies to reduce the total amount of opiates needed for pain control need to be aggressively

pursued in order to limit the patient's exposure to narcotics. The elective use of intravenous acetaminophen (Ofirmev) and ketorolac intraoperatively as part of a multimodal approach to postoperative pain reduces the total amount of narcotic needed by the patient for pain management. This is essential for managing the sympathetic nervous system activation from pain and resultant further slowing of intestinal motility (Apfel, Turan, Souza, Pergolizzi, & Hornuss, 2013). The author's original PONV protocol included the routine administration of Ofirmev, an effective intravenous acetaminophen medication with opiate sparing properties. It became necessary to delete this component of the protocol recently, due to escalating costs from the manufacturer and subsequent restriction of its use in the author's hospital. Ketorolac, a COX-2 inhibitor, decreases pain through inhibition of the inflammatory response (Chandrakantan & Glass, 2011). It is still available in the generic form and is cost effective for the institution. Its use is restricted in patients with known renal impairment or patients at risk for bleeding.

Propofol anesthesia for known refractive patients. The use of a Propofol infusion as a sole anesthetic or total intravenous anesthesia (TIVA), while costly decreases the incidence of early PONV and overall PONV by 25% (Gan et al., 2014; Rusch, Eberhart, Wallenborn, & Kranke, 2010). This effect has been shown to have its greatest impact in the early postoperative phase with the effect diminishing after several hours (Tramer, Moore, & McQuay, 1997). This outcome may be mediated by the removal of the patient's exposure to volatile anesthesia with the infusion in refractory patients. Inhalation agents statistically are equal in their tendency to increase PONV incidence. Furthermore, this risk is incrementally increased with the total number of hours patients are exposed to these agents (Wallenborn et al., 2007). TIVA can be substituted for inhalation agents, but high cost of administration is prohibitive; consequently the

technique is reserved for patients who are both refractory and have a consistent and significant history of PONV.

Current Evidence-Based Recommendations

A need for implementation of a standardized, evidence-based PONV prevention plan was identified based on a review of the PONV literature, and an assessment of the incidence and practices related to PONV at the author's healthcare organization. Current evidence supports the use of a multimodal approach with single therapy for low risk patients and the use of multiple pharmacological agents for those at increased risk (Kovac, 2013). Modifying the anesthetic technique and preemptive treatment of pain to decrease the overall risk is part of this plan to provide outstanding tailored care to the individual patient to minimize suffering and maximize patient satisfaction. The use of these various therapies can reduce the underlying risk of PONV to 10-20% in even the highest risk patient (Rusch, Eberhart, Wallenborn, & Kranke, 2010). The goal of this DNP project was to describe the use of the PONV protocol in the author's institution.

Chapter 3: Methods

Project Design

The proposed project employed a retrospective descriptive design. A one-time observation (O_1) of de-identified patient data using a previously developed assessment tool took place within the Same Day Surgical Center over a 14-day period. A retrospective convenience sampling of de-identified patient anesthesia records was employed. Information obtained was used to describe the accuracy of risk score assessment and implementation of the protocol by the anesthesia staff.

Setting

The project was conducted at a large Midwestern Level I Trauma Center.. This facility had approximately 15,042 surgical procedures for 2012, 9689 of them or 64% designated as outpatient. The Ohio State University (OSU) College of Nursing and the healthcare institution undertook a review of the project. This project was evaluated and designated as a quality improvement project not requiring IRB approval by both OSU and the healthcare organization.

Sample

A convenience sample via a retrospective records audit of outpatient surgical anesthesia records over a 14-day interval was conducted. The PONV protocol was designed for the prevention of postoperative nausea and vomiting and has been in use since February 2013. The inclusion criteria for this DNP project encompassed all patients who underwent outpatient surgical procedures who were at least 18 years old and received non-regional anesthesia. For this project, the PONV prevention protocol evaluation was focused on only the outpatient surgical population. Patients excluded from the project evaluation included all inpatient surgical patients, pediatrics, and parturients. Endoscopic and cataract procedures were also excluded.

Procedures

All operative post anesthesia patients within the identified 14-day period who met the project criteria were assessed using the observational tool developed by the researcher. The anesthesia records were obtained daily during the data collection period and stored in a de-identified manner. A total of 269 records were examined during the two-week time frame. All computer files have been kept in a secure password-protected computer and no other copies of the files were kept. Data collected from incomplete records were marked unknown (UNK) for the examined variable.

Instrument

An assessment tool was developed by the author to describe the patient demographics and intraoperative treatments received (Appendix C) using nominal and interval scales. The patient's gender, smoking status, opioid administration and history of PONV are all known risk factors for PONV (Apfel, Philip et al., 2012). Intraoperative evidenced based preventative measures were incorporated into the PONV protocol which included the administration of ondansetron, dexamethasone, rehydration with intravenous fluids (10-15 ml/kg) and the avoidance of excessive opioids for pain control with the administration of alternative analgesics (ketorolac) (Apfel, Meyer, Orhan-Sungur, Jalota, Whelan, & Jukar-Rao, 2012). Evaluation of the use of the Apfel Risk Assessment Score (Apfel, Laara, Koivuranta, Greim, & Roewer, 1999) by the staff was based on the calculation of risk factors from the pre-operative anesthetic assessment portion of the anesthetic record. The instrument was designed by the author and has not been formally validated. This project is the first step in examining the possible impact of the PONV protocol by providing important information with regards to its utilization by anesthesia providers.

Data Analysis

Using the observational tool, data were collected and subsequently entered into an Excel spreadsheet. Descriptive statistics and frequencies were computed to evaluate the utilization of components of the PONV guidelines. Descriptive statistics and frequencies were computed for socio-demographic and clinical variables in order to characterize the sample and to address the first project question regarding the utilization of the PONV protocol.

Chapter 4: Findings

Results

Description of the Sample

The sample obtained consisted of records from 269 surgical outpatients who experienced an outpatient surgical procedure requiring anesthesia within the two week time period. The sample consisted of 93 females and 176 males. Their ages ranged from 19-93 years. Mean age was 52.43. A majority of the patients were young and middle-aged adults age 18-60 (65%). The literature describes the outpatient surgical population as being comprised of a majority of females but in this sample 65% of the patients were male. Table 1 provides a demographic description of the sample including information related to smoking history, history of post-operative nausea and vomiting and ASA score. Those stated as having a history of PONV were unexpectedly low at 6.3%. This may be the result of the increasing effort to use prophylactic antiemetics, resulting in an overall decrease in incidence.

Smoking prevalence, which is protective for PONV, was reflective of the national trend of declining numbers of smokers. In the United States, smoking reached an all time high of 80% of adult males in 1950 (Holford et al., 2014). The onset of smoking acceptability for females resulted in a delayed peak of 70% smoking adult females by the late 1960's (Holford et al., 2014). Since its peak in the 1960's, smoking has declined within the United States as a whole. Our sample reflects this national trend with 74.3% listed as nonsmokers.

Table 1: Description of the Sample:

Demographic Descriptors	Male	Female	Valid Percent	Not Reported
Gender	176	93	100.0	1
Age				
18-40	15	54	25.6%	
41-60	40	65	39.0%	
61-80	35	52	32.3%	
81-100	3	5	2.9%	
Smoking History				2
Yes	27	39	24.5%	
No	65	135	74.3%	
History of PONV				0
Yes	2	15	6.3%	
No	91	161	93.6%	
ASA Score				0
1	8	21	10.7%	
2	46	96	52.7%	
3	27	48	27.8%	
4	12	11	8.5%	

PONV = Postoperative nausea and vomiting; ASA score = *American Society of Anesthesiologists* Risk Assessment Score for anesthetic risk

Anesthesia Risk Assessment

One of the variables assessed was the ASA score. Since the 1960’s, the American Society of Anesthesiologists (ASA) has utilized a scoring system for the anesthetic risk assessment for each patient (Mak, Campbell, & Irwin, 2002). This is an example of an ordinal scale (Stommel & Wills, 2004) created to describe patients’ comorbidities (Appendix B). Scores range from 1-6 and are on a continuum from health to brain death. A score of one corresponds to no health factors whereas a score of five indicates imminent death. Six is reserved for those who are organ donors. The majority of the sample consisted of ASA 1-3 (91.2%), which would be expected in a population, which anticipated same day discharge without need for observation overnight.

Utilization of the Risk Score Assessment

The data collected relating to the utilization of the risk score assessment indicates a lack of documentation by practitioners. The number of records with a risk score documented was 136

or 50.4%. Risk score documentation is usually accomplished in preoperative testing (PAT). Of the scores recorded, 92.6% were accurately calculated. However, 133 patients (49.4%) had no risk score documented. Of the 133 patients who did attend PAT, 51 or 38.3% of these patients also did not have a documented risk score even though they were seen for preoperative assessment by the RNs.

It is of interest that the data showed a lack of participation in the PAT process amongst the sample of outpatient surgical candidate records. Of the 269 patients in the sample, 82 or 30.5% were not seen until the day of surgery. Therefore, no PAT was performed. This left the responsibility for assessing and documenting the patient’s PONV status to the anesthesiologist, as an add-on to the entire health/surgical history. The result was that 82 patients did not have a score documented. This subset was retained in the sample to provide a comprehensive review of all surgical patients.

Table 2: Use of Risk Score Description

Sample Descriptors	Frequency	Percent	Missing
Attended Preoperative Testing (PAT)			1
Yes	187	69.5%	
No	82	30.4%	
PONV Score			2
1	35	13%	
2	90	33.3%	
3	124	45.0%	
4	14	5.2%	
4+	5	1.9%	
Risk Score Documented			1
Yes	136	50.4%	
No	133	49.4%	
No PAT or PONV score	82	61.6%	
Accurate Risk Score Calculation for Scores Recorded			5
Yes	126	92.6%	
No	11	8%	
None Documented	128	49.4%	

Description of Protocol Interventions

The implementation of the protocol involved medications and anesthetic decisions. Of the 269 patients involved, 88.5% received ondansetron, which should have been universally given. Of that number, 159 or 59% received the ondansetron within the 30-minute window before emergence as directed by the protocol and best practice recommendations.

The protocol designated that Dexamethasone 4 mg be given to anyone with a risk score of two or more. In the sample 113 out of 269 received the 4 mg dosage or 41.9%. The time frame for this dosage was within 20 minutes of induction. The timely administration of the dexamethasone was not examined in this review.

The adjunct use of nitrous oxide with oxygen in general inhalational anesthesia has declined in recent years due to its known association with PONV. Out of 175 documented general anesthetics, there were 26 anesthetics using nitrous or 14.8%. There were 39 records wherein an adjunct carrier gas was documented as given but the record did not indicate whether it was Air or Nitrous. The fact that so many records were incomplete suggests that the number may actually be higher. Fifty-four surgical cases were classified as monitored anesthesia care (MAC), a type of anesthesia that uses intravenous sedation, but no inhalational anesthetic is employed.

The use of intravenous fluids to correct dehydration at 10-15 ml./kg as tolerated is supported in the literature as a preventative measure for both PONV as well as post discharge nausea and vomiting (Apfel, Meyer et al., 2012). Out of 269 patients, 148 or 54.8% received the appropriate fluid therapy. One hundred patients or 37% received less than 10 ml./kg and 20 more either could not because of end stage renal disease or the total intravenous fluid administration was not documented.

The last designation of 4+ in the protocol designates the usage of Emend, a Neurokinin-1 inhibitor that is highly effective in not only PONV but post discharge nausea and vomiting (Apfel, Malhotra, & Leslie, 2008). It is not available in generic form so while it is highly effective its use is limited for the general surgical population (US\$80/single dose), and within the author's institution, cost-containment protocols require that its use must be justified. In our sample only eight patients or 3% received Emend.

Finally, the reversal of neuromuscular blocking agents has been associated with an increased risk of PONV. Reversal dosages of Neostigmine 0.08 mg/kg up to the maximum of 5 mg are routinely given to patients at the end of surgical procedures requiring muscle relaxation. Muscle relaxation exists on a continuum so that if the patient is maintained in a partially relaxed state, the relaxed state is easily reversible with less Neostigmine and less risk for PONV. In the author's institution it is common practice to give only 3 mg. Neostigmine to patients for reversal even though the textbook dosage is 5 mg. for anyone over 58 kg. This is designed to minimize the incidence of PONV and bronchospasm, which higher doses can cause (Morgan, Mikhail, & Murray, 2006). Out of the 111 cases, which may have required reversal, only 12 or 10.8% received a full reversal dose of 5 mg Neostigmine. Ninety-nine or 89% received less than 5 mg (Table 3).

Table 3: Description of Interventions:

Descriptors	Frequency	Percent	Missing
IV Therapy 10-15 ml/kg			
Yes	148	59.6%	
No	100	40.3%	
NA ESRD	8	3%	
UNK	12	4.4%	
Ondansetron Given			3
Yes	239	88.5%	
No	28	10%	
Ondansetron 30 min before emergence			1
Yes	159	59%	
No	109	40%	
Decadron 4 mg			2
Yes	113	41.9%	
No	155	57.4%	
Nitrous			
Yes	26	14.8%	
No	149	55.2%	
UNK	39	14.4%	
Not General	54	20%	
Anesthesia Less than 5 mg Neostigmine			1
Yes	99	89%	
No	12	10.8%	
MAC	129		

NA ESRD=Not applicable; end-stage renal disease; MAC=monitored anesthesia care

Multimodal Pain Therapy

Opioid usage in the perioperative phase is associated with increased PONV risk (T. J. Gan et al., 2014). In our sample, 92.2% of patients received some type of narcotic. The overwhelming majority of narcotic used was fentanyl with 245 out of 269 patients or 90.7%. Fentanyl is routinely given in anesthesia to blunt the sympathetic response on induction to endotracheal intubation (Morgan, et al., 2006). It is also routinely given in monitored anesthesia care as part of a balanced intravenous sedative anesthetic. Longer acting narcotics such as hydromorphone (Dilaudid) and morphine sulfate are given before emergence to provide long acting pain relief in anticipation of operative pain. These are more commonly given during major

surgical procedures where moderately severe post-operative pain is anticipated. In our sample, only 3.3% of patients received morphine sulfate and 16.3% received hydromorphone.

The use of non-narcotic pain adjuncts is encouraged to reduce narcotic exposure. Our sample demonstrated 38.5% usage of ketorolac and 10.7% usage of Ofirmev. Ofirmev was eliminated from the protocol immediately prior to data collection due to escalating cost. Usage had been very high for most surgical patients.

Table 4: Pain Control Therapies

Pain Control Intervention	Frequency	Percent
Opioids Total	249	92.2%
Fentanyl	245	90.7%
Morphine	9	3.3%
Dilaudid	44	16.3%
Demerol	0	0
Ketorolac	104	38.5%
Ofirmev	29	10.7%

Chapter 5: Discussion and Implications

Discussion

This descriptive pilot evaluation of the use of the PONV Protocol demonstrates the difficulties associated with the implementation of a new process with a large number of practitioners. The protocol was developed by the author in 2012-2013 and implemented in the spring of 2013. Inservice education for staff was completed in May 2013, and consisted of joint morning sessions for our 55 Certified Registered Nurse Anesthetists (CRNAs). Attendance by the physician anesthesiologists was not universal. Didactic information regarding the literature review via power point was presented; a written handout was also provided.

Incorporating the Apfel PONV risk score (Apfel, Laara, Koivuranta, Greim, & Roewer, 1999) on the reverse side of the anesthesia record with the preoperative assessment took until the fall of 2014 to implement. Our pilot descriptive project demonstrates that change within the macrosystem is difficult even when substantive efforts have been made to present information. A variety of factors influence adoption of evidence-based protocols. One of these is that practitioners view these protocols as “cookbook medicine” while impinging on their autonomy (White & Dudley-Brown, 2012). Implementation may also be affected by patient factors such the need to restrict fluid administration in patients with end-stage renal disease or the fact that steroid administration is contraindicated for many diabetics. The planned multimodal intervention was unexpectedly influenced by the untimely cost escalation of Ofirmev, which had been given to most patients to reduce narcotic administration. The removal of Ofirmev from the protocol led to a search for alternate methods to decrease narcotic usage. This significantly impaired our ability to avoid narcotics, as many patients have contraindications to non-steroidal anti-inflammatories (e.g., allergy, renal function, intraoperative bleeding or surgeon preference),

and some surgeons prefer to avoid prescribing this category of drugs. Other avenues currently being explored include esmolol and lidocaine infusions.

Data collection focused on the degree to which the guidelines were implemented. Some of the questions answered included: To what degree was a risk score assessment documented on each anesthesia record? Was the documented risk score assessment accurately calculated? Based on the assessment, did the patient receive the appropriate preventative regime specific to their risk score, allergies, and comorbidities? This was the first step in evaluating the impact of this practice change through evaluating staff participation.

The variables of age, gender and ASA score were documented universally at 100%. This is expected since these elements are necessary for billing purposes. Smoking history also had a high rate of documentation with only two missing or blank records on this inquiry. Smoking history is a critical variable in the preoperative anesthetic assessment of patients. It was encouraging to the author to see that the incidence of smokers in the sample was only 24.5%.

The reported incidence of PONV history was low at 6.3%. Several factors may have contributed to this. Our population had a mean age of 52.45. Younger patients (pediatrics and young adulthood) demonstrate a higher risk for PONV than those over 50 (Gan et al., 2014). Our sample as a whole may represent a segment of surgical patients but not of the high-risk group of younger patients who may undergo surgery. Secondly, many people were being interviewed on the day of surgery by the anesthesiologist (82/269 or 30.4%). Asking about a history of PONV may or may not have been included in their interview. In theory, up to 30% of the sample may not have been adequately assessed for PONV history. This may have also impacted the demographics of the sample.

This pilot project incidentally identified a significant problem with patients being seen for preadmission testing (PAT) which is designed to be universal. Out of the entire sample, 30.4% did not go through PAT or 82 people within the two-week sampling period. And this sample was only of patients who were experiencing outpatient surgery. The entire population of patients who anticipated a surgical procedure requiring admission was not examined.

Of this group, 23 (27%) were categorized as ASA 3 indicating “A patient with severe systemic disease (some functional limitations)” (Appendix B). Within the group of 82 not seen were also eight individuals (9.4%) classified as ASA 4 or “patient with severe systemic disease that is a constant threat to life.” This dysfunction within the microsystem could result in significant delays and costs on the day of surgery, as additional tests may need to be done and consults obtained to prepare these patients for their procedure. The omission of PAT leaves little time for a thorough evaluation by any provider, and the tendency to proceed to avoid schedule delays.

The documentation of the Apfel risk score on the anesthesia record overall was low at 50.4% or 136 out of 269 patients. A component of the difficulty with documentation of the risk score is the lack of check box on the anesthesia record at present. The author has attempted to get this score placed on the anesthesia record for well over a year without success. Now, with the anticipation of electronic medical records (EMR), there is little motivation to redesign the paper anesthesia record that currently exists. Consequently the score must be added in hand, and has not become part of the institutional process as yet. Efforts to incorporate this into the design of the anticipated EMR are underway.

Evaluation of the implementation of the evidence-based protocol is mixed. Most of the providers are using less than 5 mg. of Neostigmine for reversal (89%) and only 14.8% are using

nitrous oxide a known emetogenic inhalation agent. Ondansetron is being given in a vast majority of the cases (88.5%) but not at the designated time frame of 30 minutes before emergence (59% within the time frame). The use of dexamethasone 4 mg is lower at 41.9% and may be reflective of the presence of comorbidities such as diabetes, which prohibits its usage.

Adequate hydration of the surgical outpatient is essential for successful discharge and patient comfort. This one factor is key in enabling the surgical outpatient to be timely discharged and remain at home. In this respect, our institution has not attained our goal to provide adequate hydration to these outpatients. Only 54.8% of patients received the goal volume of 10-15 mg/kg. Since inadequate control of PONV and pain are the two main factors in hospital readmission in the immediate postoperative period, this is a vital component to the management of these patients. Hospital readmission increases healthcare costs and very often results in decreased reimbursement by Medicare and private insurance. This is a low cost high return therapy, which should be implemented by anesthesia providers.

Limitations:

The project was limited in its scope. Our sample size of 269 was a very small representation of the surgical outpatients at the author's institution. As a quality improvement process evaluation, this project is not generalizable to outpatient surgical populations in general. It was a descriptive look at the protocol implementation and variable identified by the author, which were of interest regarding PONV. There may be many other variables, which may be influencing the incidence of PONV, which have not been identified. The project also was not designed to examine the impact of multimodal therapy on the incidence of PONV, which is the ultimate goal of the protocol.

Some staff indicated that they had never heard of the protocol despite having presented the material to our weekly in-service education presentation. It may have been possible that they were not present or the presentation in 2013 was so distant that they had forgotten. An update on the scoring and interventions may have been helpful immediately prior to the implementation as a review.

During project implementation, we also encountered some difficulties which were not anticipated or within our control. The inability to have the score placed on the anesthesia record as part of the printed assessment affected the documentation of scores. Practitioners are more likely to fill in a box that is present on a form than to add hand-written data. It is hoped that with the initiation of the EMR this problem will be resolved.

The discovery of the significant percentage of patients without preoperative assessment prior to the day of surgery on the record was unanticipated and is a key finding. This information will assist the Department of Anesthesia to plan for a more efficient perioperative phase.

Conclusions:

Our project demonstrated that there continues to be a lack of consistency in the prevention of PONV even when practitioners are provided evidence based information and guidelines. Both Rogers (2003) and White and colleague (2012) describe the difficulties in implementing change within macrosystems. This project has demonstrated to the author that even with didactic presentation of evidence-based practice and delineation of a set protocol, some practitioners may continue to resist change.

The implementation of various therapies to decrease the incidence of PONV showed some progress in our institution from when the literature search began. Patients are now routinely receiving ondansetron. Total intravenous anesthesia with Propofol infusion for those at

high risk of PONV has continued to not be popular with practitioners even though recommended in the literature. Our project did not have any patients who were treated with this type of anesthesia. This may be the result of practitioner preference or a lack of familiarity with this technique.

Summary

In summary, the translation of evidence-based practice is essential for the dissemination of current research into practice. An organized thorough review of the literature with regards to any inquiry is essential for the preparation of any evidence-based change in patient care. The ultimate goal of these efforts is improved patient satisfaction and outcomes and the advancement of evidenced-based practice through continued feedback on the implementation of research and the development of new knowledge.

Implications for Nursing Practice, Patient Outcomes and DNP Practice

It is crucial for the advancement of patient-centered healthcare to speed the translation of evidence-based research into practice. The dissemination of this research requires the macrosystem of the hospital to be in a constant state of amended change. This places healthcare professionals on the front lines of innovation and change, which can be stressful and sometimes resisted. The healthcare team must be willing to adopt changes based on evidence, transform them as needed into their own system and implement them (Rogers, 2003). Rogers identifies early adopters as those who embrace evidence-base change. The author believes this is the stage we are currently in with the implementation of the PONV protocol. The insights gained into how to implement practice changes within our anesthesia department (what has worked/not worked) is invaluable. It is clear that didactic presentation alone is inadequate to effect consistent sustainable change.

The continued development of practice changes based on current literature is one of the key roles of the DNP prepared advanced practice nurse. DNPs possess the clinical expertise to appraise current literature and as part of an interdisciplinary team, develop patient-centered care initiatives. The ultimate goal is always to improve patient outcomes with the delivery of safe, cost-effective care based on evidence.

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Appendix A

PONV Prophylaxis Protocol:

1. Risk assessment in the preop testing phase using Apfel's quick scoring (Apfel et al., 2003)
 - a. Risk factors: each receiving one point
 - i. Female
 - ii. History of motion sickness or PONV
 - iii. Nonsmoker
 - iv. Intraoperative or postoperative opioid administration
2. Documented on the anesthesia record
3. Plan:
 - a. Score 0-1:
 - i. Zofran 4 mg within 30 minutes of the end of the case
 - ii. Clear liquids up to 2 hours preoperatively
 - b. Score 2:
 - i. If tolerated, IV fluid therapy 10-15 ml/kg
 - ii. Decadron 4 mg IV at the beginning of the case (within 15 minutes after induction)
 - iii. Zofran 4 mg IV within 30 minutes of the end of the case
 - iv. Toradol 30 mg IV if tolerated
 - v. Clear liquids up to 2 hours preoperatively
 - c. Score 3:
 - i. All therapies above
 - ii. Avoid Nitrous Oxide
 - iii. Maintain two twitches with muscle relaxant—avoid full reversal dose if possible
 - d. Score 4:
 - i. All therapies above.
 - ii. Decadron 8 mg. after induction (within 15 minutes of induction)
 - iii. Consider Total IV anesthesia infusion (no inhalational agent)
 - e. Score 4+
 - i. All therapies above
 - ii. Give Emend 40mg. PO in Same Day Preop at least 1 hour prior to surgery

Appendix B

ASA Scoring

Class	Definition
1	A normal healthy patient
2	A patient with mild systemic disease (no functional limitations)
3	A patient with severe systemic disease (some functional limitations)
4	A patient with severe systemic disease that is a constant threat to life
5	A moribund patient who is not expected to survive without the surgery
6	A brain-dead patient whose organs are being removed as a donor

Appendix C

Post-Operative Nausea and Vomiting
Evaluation Tool
Summa Health System

Demographic Information

Gender Male
 Female

Age: _____

Weight in Kg. _____

Smoking History: Yes
 No

History of post-operative nausea and vomiting/motion sickness:
 Yes
 No

Use of intra-operative opioids: Yes
 No

Was a Risk Score Documented? Yes
 No

Was it accurately calculated per Apfel risk assessment? Yes
 No

PONV Risk Score Preop: _____

Total Amount Intraoperative IV Crystalloids: _____cc

Did the patient receive intra-operatively:

Anesthetic Options	Yes	No
Ondansetron 4 mg within 30 minutes of end of case		
IV fluid therapy 10-15 ml/kg		
Dexamethasone 4 mg IV within 15 minutes of induction		
Ketorolac 30 mg IV		
Ofirmev 1000 mg IV		
Nitrous Oxide intra-operatively		
Less than 5 mg. Neostigmine reversal		
Intraoperative Meperidine		
Intraoperative Fentanyl		
Intraoperative Morphine		
Intraoperative Dilaudid		
Total Intravenous Anesthesia		