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An Educational Module for the Utilization of P6 Acustimulation to Decrease PONV in Women 18 Years of Age and Older: A Quality Improvement Project

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An Educational Module for the Utilization of P6 Acustimulation to Decrease PONV in Women 18 Years of Age and Older: A Quality Improvement Project

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ABSTRACT

Background: Postoperative nausea and vomiting (PONV) can be an untoward side effect of surgery and anesthesia with higher incidences in women. This overarching problem can negatively affect patients, causing fear, discomfort, and potential complications. P6 acustimulation has been studied for years in Traditional Chinese Medicine (TCM) for decreasing nausea and vomiting but is not widely used in the anesthesia community to treat PONV.

Objectives: (1) To evaluate the effect of P6 acustimulation on nausea and vomiting in postsurgical women greater than 18 years old utilizing three databases: CINAHL, EMBASE, and PubMed. This systematic review will serve as the basis for objective two. (2) To demonstrate an increase in knowledge in anesthesia providers pertaining to P6 acustimulation in the treatment of PONV.

Methodology: Eight randomized control trials (RCTs) were evaluated in this systematic review containing a total of 784 women. The RCTs found a statistically significant decrease in PONV with the application of P6 acustimulation. With this information, a pre-test, educational module, and post-test were created for anesthesia providers to evaluate both baseline knowledge and knowledge growth.

Results: The statistical analysis between the pre-test and post-test showed an increase in provider knowledge. There was also an increase in the providers' likelihood to use P6 acustimulation if offered at their respective hospitals.

Conclusions: P6 acustimulation is a holistic, adjunctive treatment to traditional pharmacologic antiemetics that has been shown to reduce PONV effectively. Although not widely used in anesthesia practice, this educational intervention increased provider knowledge and the likelihood of implementing P6 acustimulation into practice. Continual implementation of this quality improvement project has the potential to decrease PONV and increase patient comfort.

Keywords: P6, P6 acupressure, P6 acustimulation, Neiguan, transcutaneous electrical acupoint stimulation (TEAS), women, postoperative nausea and vomiting (PONV)

INTRODUCTION

Description of the Problem

The fear of pain and awareness while undergoing surgery was eliminated in 1846 as T.G. Morton performed the first successful anesthetic using ether to induce general anesthesia.[1] Advances in anesthesia since 1846 have introduced new techniques and medications to ensure safe and effective amnesia and analgesia during surgical procedures. However, the advent of new practices also brings new hurdles. Postoperative nausea and vomiting (PONV) is reported to be the second most feared event by patients undergoing surgery.[2] It is a multifaceted and potentially debilitating issue, causing patients discomfort, angst, and delayed recovery.

The incidence of PONV can be as high as 80%, depending on the number of patient risk factors.[2] Risk factors can be broken up into three different categories: patient, surgical, and anesthetic. Patient risk factors contributing to PONV include female gender, obesity, young age less than 50 years old, history of motion sickness, and being a non-smoker.[3,4] Being female is consistently the most substantial risk factor for PONV, with women having a three-fold risk when compared to men.[5] Surgical risk factors are non-modifiable and primarily based on the type of surgery, including gonadal, obstetric, laparoscopic, cholecystectomies, and ear, nose, and throat surgeries.[2] Another surgical risk factor is surgical length. It has been shown that increasing the duration of the surgery by 30 minutes can increase PONV risk by 60%.[2] Anesthetic risk factors include the use of opioids for analgesia and inhalational anesthetics (including nitrous oxide) for sedation.[3] Patients in the surgical setting have a multitude of modifiable and non-modifiable factors that are predispositions to developing PONV.

Nausea is defined as the subjective, unpleasant sensation to vomit and is controlled by cortical structures.[2,6] Vomiting is defined as the expulsion of gastric contents from the mouth and is governed by the medulla oblongata.[2,6] The pathophysiology of nausea and vomiting involves four main afferent pathways: the chemoreceptor trigger zone (CTZ), vestibular system, vagal pathway of the gastrointestinal (GI) tract, and cerebral cortex.[4] When serotonin, dopamine,

histamine, and muscarinic receptors in these areas are stimulated, nausea and vomiting are induced.[6] The CTZ is located on the medulla oblongata and outside the blood-brain barrier (BBB), making it sensitive to emetogenic chemicals.[2] The vestibular system is stimulated by movement.[4] Serotonin is released in the GI tract in response to surgery and stress, triggering serotonergic emetic receptors.[4] The cerebral cortex, which processes higher-order thoughts, responds to visual & olfactory sensory input.[4]

Traditionally, medications such as 5-HT3 (serotonin) antagonists, dopamine antagonists, antihistamines, antimuscarinics, and corticosteroids, are used to treat PONV. These medications only partially help reduce the incidence of PONV and can be associated with adverse side effects and drug-drug interactions.[3] Serotonin antagonists, like ondansetron, are the most commonly used antiemetics both prophylactically and as treatment. [3] Adverse effects of this drug class include QT prolongation, headaches, constipation, and raised liver enzymes.[3,6] Dopamine antagonists, like metoclopramide, reduce PONV by two mechanisms: antagonizing dopaminergic receptors and promoting GI motility.[3] Side effects include extrapyramidal symptoms, sedation, headache, and hypotension when given as a fast bolus.[3,6] Antihistamines, specifically H1 antagonists like diphenhydramine, can induce drowsiness, urinary retention, xerostomia, and blurred vision.[3] Antimuscarinics like scopolamine inhibit acetylcholine from binding to muscarinic receptors in the vestibular system.[3] This drug class can create visual disturbances, ipsilateral mydriasis, sedation, and xerostomia.[6] The method by which corticosteroids, like dexamethasone, reduce PONV is not fully understood. It may be related to the drug's ability to decrease the number of inflammatory mediators and directly inhibit serotonin receptors.[3] However, steroids can contribute to impaired wound healing, uncontrolled hyperglycemia, and increased infection risk.[6] The pitfalls of pharmacological treatment leave room for improvement, specifically with the use of P6 acupoint stimulation.

Background

The goal of anesthesia is to increase perioperative comfort and tolerability; however, it can potentially invoke the opposite effect. Untreated PONV can lead to electrolyte imbalances, pulmonary aspiration, wound dehiscence, dehydration, hematoma formation, and esophageal rupture.[7] Uncontrolled PONV can result in delayed recovery, unplanned hospital admission, and increased medical costs.[3]

The volume of same-day and ambulatory surgeries has risen 300 percent from 1996 to 2006.[8] In 2006, an average of 50 million ambulatory surgeries was performed, with females making up a more significant proportion (30 million) than males (22 million).[8] This stark proliferation has led to an increased need for timely discharge from the post-anesthesia care unit (PACU).

Hospitals would financially benefit from an evidence-based solution to this overarching problem. When comparing the economic burden of inpatient and outpatient nausea treatment in parturients, a Canadian study reported the mean outpatient cost at €985, and the inpatient cost at €3,837.[9] Furthermore, a US study appraised the annual cost of nausea and vomiting in pregnant women to be $1.06 billion in 2012.[10] Patients who experience PONV stay an average of 20-25 minutes longer than patients who do not, which decreases postsurgical turnover.[11] Habib et al.[7] found that a PONV incidence of 37% results in an extra $2,775 per 100 patients.

Despite a multitude of available antiemetics, PONV remains a very prevalent issue. P6 acustimulation has been used for thousands of years in traditional Chinese medicine (TCM) but is beginning to gain leverage in western medicine.[12] P6 acustimulation has been proven through various randomized control trials (RCTs) as an effective treatment of PONV[12-19]. As the first holistic treatment for PONV in the hospital setting, it has the potential to offer a better patient experience while increasing comfort and decreasing cost.

Systematic Review Rationale

P6 (also known as pericardium six or Neiguan) is a region of the anterior forearm, two inches proximal to the crease of the wrist, and located between the flexor carpi radialis and palmaris longus tendons.[20] This area has long been recognized in TCM to regulate the stomach and prevent nausea and vomiting.[21] Stimulation of P6 increases endorphin release into the cerebrospinal fluid and alters serotonin transmission, a major neurotransmitter involved in nausea and vomiting.[12] P6 stimulation also increases vagus nerve firing, which increases gastric peristalsis, ultimately contributing to decreased nausea and vomiting.[12] There are various methods of stimulating the P6 region, such as acupressure, needle acupuncture, needle electrical stimulation, and transcutaneous electrical acupoint stimulation (TEAS).[22]

When researching PONV, a predominant theme was that the volume of surgeries has increased over the decades, yet the percentage of PONV has remained the same. There is a gap in research for a low-risk, high-yield treatment to address the costliness and discomfort that PONV has on the patient and hospital. Research articles depicting the downfalls of pharmacologic treatment present P6 acustimulation as a feasible option, but a systematic review examining its use in women does not exist. Since women are three times more likely to experience PONV than men, women are a high-value group.[5]

Objectives of the Systematic Review

The purpose of this systematic review is to identify and examine the ability of P6 acustimulation to reduce PONV. The goal is to reduce this overarching postsurgical problem while decreasing medical costs and increasing patient comfort. Only randomized control trials will be used to answer the PICO (patient, intervention, comparison, outcome) question: (P) In female surgical patients 18 years and older (I) does an educational module for anesthesia providers on the utilization of P6 acustimulation (C) compared to traditional no education (O) increase anesthesia providers' knowledge on decreasing PONV using p6 acustimulation.

METHODOLOGY OF LITERATURE REVIEW

Search Strategy and Sources

A review of the literature was conducted to identify research articles on P6 acustimulation in women for PONV. The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) checklist was used to ensure articles meet the minimum requirements for quality assurance.[23] This search utilized three databases: Cumulative Index of Nursing and Allied Health Literature (CINAHL), Excerpta Medica Database (EMBASE), and PubMed. A PICO question was used to guide Boolean phrases and keywords when searching the databases, detailed in Table 1. The CINAHL database resulted in 147 articles, EMBASE yielded 74 articles, and PubMed resulted in 126 articles. As of October 25, 2020, the search is current. This search of three databases produced 347 articles to be critically appraised.

Table 1. Database Search

Databases	Topic: P6	Topic: PONV	Population	Results
CINAHL	("P6 acu*" OR "Neiguan")	("PONV" OR "postoperative nausea vomiting")	("women" OR "female")	-Yielded 293 results -Ten-year filter from 2010 to 2020 was applied, which yielded **147 results**
EMBASE	("P6 acupressure" OR "Acustimulation" OR "Neiguan")	("PONV" OR "postop* nausea vomiting" OR "naus*")	("women" OR "female")	-Yielded 154 results -Ten-year filter from 2010 to 2020 was applied, which yielded **74 results**
PubMed	("Neiguan" OR "P6" OR "Acupressure" OR "Acustimulation")	("PONV" OR "Nausea" OR "Vomit*")	("women" OR "female")	-Yielded 326 results -Ten-year filter from 2010 to 2020 was applied, which yielded **126 results**

Study Selection and Screening of Evidence

The preliminary PICO question was used to screen and identify relevant research based on article titles and abstracts. Randomized Control Trials (RCTs) were exported to EndNote Library and checked for duplicates. Articles were organized into three folders: "Background," "Relevant," and "Irrelevant" and sorted based on the article title and abstract.

Strict inclusion and exclusion criteria were applied to 182 articles as described in Table 2. The inclusion criteria included RCTs in English, published between 2010 to present, women over 18 years old, postoperative nausea and vomiting, and interventions of P6 acustimulation, including transcutaneous electricity and pressure. Studies differed in the verbatim definition of nausea and vomiting but agreed that nausea was defined as the unpleasant sensation associated with the urge to vomit, while vomiting was defined as the expulsion of gastric contents from the mouth.[12,17,19] Acupressure was defined as a plastic button overlying P6, held in place with an elastic wrist band. Acustimulation was defined as electrical stimulation overlying P6. Exclusion criteria included research trials still in progress, systematic reviews, questionnaires, RCTs published before 2010, men, persons <18 years old, women with nausea related to chemotherapy or cancer, P6 to treat vertigo or pain, acumassage, auricular pressure, and P6 for migraine treatment.

Sixteen articles were placed into the "Relevant" folder and underwent full-text screening. Upon further examination, eight of these research articles were excluded. Five articles were the wrong patient population (e.g., men, <18 years old, nausea not associated with surgery), and three articles studied the wrong outcomes (e.g., pain). Appendix F depicts the literature screening methodology formatted as a flow diagram.

Table 2. Inclusion and Exclusion Criteria

Inclusion	Exclusion
Population: • Women >18 years old experiencing PONV Intervention: • P6 Acustimulation Outcomes: • Reduced PONV Type of Study: • Randomized controlled trials • English Language • Publication date 2010-Present	Population: • Men • Pediatrics • Women <18 years old • Women with chemotherapy/cancer-induced nausea Intervention: • P6 for vertigo • Acumassage • Auricular pressure for PONV Outcomes: • Analgesia • Migraine prevention Type of Study: • Research trials still in progress • Systematic reviews • Questionnaires • Publication date pre-2010

RESULTS OF LITERATURE REVIEW

Study Selection

A total of 347 articles were identified after searching three databases. 166 duplicates were removed, leaving 182 articles. These articles were screened based on titles and abstracts, eliminating 166 articles. Eight research articles were appraised using the John Hopkins' research evidence appraisal tool, which identifies the strength of evidence using three levels. Level one has the highest quality (e.g., randomized control trials [RCTs]), level two has moderate quality (e.g., quasi-experimental), and level three is the weakest in terms of quality and strength (e.g., quantitative non-experimental study).[24] This tool allows the research community to identify weak versus strong evidence in a standardized way. After the appraisal, all articles were found to qualify as level 1 evidence.

Study Characteristics

The eight studies utilized are all Level 1 RCTs published between 2011 to 2018. A total of 784 women over age 18 and undergoing surgery were included in this systematic review. All

studies had at least one intervention group testing either P6 acupressure[12-14] or P6 acustimulation.[14-19] The type of surgery varied, including gynecological surgery[12,14], laparoscopic gynecological surgery[15], laparoscopic cholecystectomy[16], thyroidectomy[18], cosmetic breast surgery[19], laparoscopic hysterectomy[17], and elective cesarean section[13].

Patient Demographics. Seven of the eight studies only included women identified as an ASA (American Society of Anesthesiologists) physical classification of I or II.[13-19]. Unulu and Kaya[12] did not specify the ASA classification of their participants; they disclosed that no verbal, cognitive, or sensory issues could be present, but no other insight on health status was revealed. Depending on hospital volume, calculated significance level, and calculated error margins, the sample size of participants varied. Six studies had less than 100 women (four studies[14-16,19] ranging from 55-65 women and two[12,18] studies slightly higher with 84 and 97 women). The remaining two had over 100 participants: one study[13] with 102 women and the second study[17] with 264 women.

Hospital Demographics. Despite the hospitals and patients being culturally and geographically diverse, all eight RCTs supported acustimulation to decrease PONV in women. Unulu and Kaya[12] performed their RCT in an obstetrics hospital in Bursa, Turkey. This hospital experienced 4,946 gynecological surgeries the year before the study began, with 58%-77% of patients experiencing PONV.[12] Ertas et al.[15] also completed their study in Turkey according to the correspondence but did not disclose the hospital used. Both Kim et al.[17] and Oh and Kim[14] performed their research trials in Seoul, the capital of South Korea. Respectively, these trials utilized the Hanyang University Hospital[17] and the Yeoido St. Mary's Hospital between April and September of 2014.[14] One RCT was completed in Winter Haven, Florida at a 527-bed community hospital, with a 13 bed-OR and 23-bed PACU.[16] Chen et al.[18] implemented their research in China at the Fujian Provincial Hospital, a 1,800-bed hospital.[25] Zhang et al.[19] also completed their study in China at Xijing University Hospital, Fourth Military Medical University. Direkvand-

Moghadam and Khosravi[13] utilized the Gynecology Division at the Mustafa University of Ilam in West Iran between September 2011 to October 2013.

Definitions and Outcomes

The two principal outcomes evaluated were nausea and vomiting in the postoperative period. Unulu and Kaya[12] define nausea as the subjective sensation preceding vomiting. Nausea is defined by Kim et al.[17] as the urge to vomit without expulsion of contents and by Zhang et al.[19] as the uncomfortable sensation accompanying the urge to vomit. Vomiting is defined by Unulu and Kaya[12] as the physical action involving contraction of the respiratory muscles and defined by Kim et al.[17] and Zhang et al.[19] as the expulsion of gastric contents from the mouth.

Nausea. All eight RCTs found that P6 acustimulation decreased the incidence of nausea postoperatively in women 18 years of age and older.[12-19] Unulu and Kaya[12] measured nausea using a 10 point visual analog scale (VAS) at five different intervals postoperatively: 0-2 hours, 2-6 hours, 6 to 12 hours, 12-24 hours, and 24-48 hours postop.[12] There was a statistically significant (SS) ($P < .05$) decrease in the intensity of nausea in the acupressure group compared to the control group who received standard antiemetics.[12] Direkvand-Moghadam and Khosravi[13] also used a 10 point scale to quantify the intensity of nausea and reported a 7% incidence of nausea in the acupressure group and a 50% incidence of nausea in the control group, making these results SS ($P < .05$). Oh and Kim[14] evaluated nausea using the Rhodes' Index of Nausea, Vomiting and Retching (INVR) at 0, 2, 6, and 24 hours post-discharge. There was a SS decrease in nausea in the transcutaneous electrical acupoint stimulation (TEAS) group versus the control group at all measured intervals ($P< .05$).[14] There was no SS difference between the control group and acupressure group ($P > .05$).[14]

Ertas et al.[15] measured nausea intensity using a four-point verbal rating scale (VRS) at intervals of 15 minutes, then 2, 6, 12, and 24 hours postoperatively. Lower VRS scores in the TEAS group were SS when compared to the control group at 15 minutes, 6, and 12 hours postoperatively and after discharge ($P < .05$).[15] The Likert Nausea Scale was used by Carr et al.[16]

and found that the TEAS group had SS decreased nausea on admission to PACU when compared to the control group ($P < .05$), but had no difference at 30 and 60 minutes or discharge ($P > .05$). Kim et al.[17] measured nausea on a scale from 0-2 and found electrical tetanus was SS in decreasing nausea when compared to the control group ($P < .05$). Chen et al.[18] measured documented nausea up to 24 hours postoperatively, and Zhang et al.[19] measured nausea at 10-minute intervals postoperatively. Both researchers discovered that TEAS decreased nausea ($P < .05$) when compared to the control group.

Vomiting. Seven of the eight RCTs found that acustimulation decreased the incidence of vomiting postoperatively.[13-19] Direkvand-Moghadam and Khosravi[13] measured the number of vomiting episodes and frequency of antiemetics given, revealing a SS difference ($P < .05$) in the control group and acupressure group. 20.5% of patients required antiemetics in the placebo group, while only 5.8% required antiemetics in the acupressure group.[13] Oh and Kim[14], Ertas et al.[15], and Carr et al.[16] also measured the number of antiemetics given and found a SS decrease ($P < .05$) in the treatment group versus the control group. Chen et al.[18] reported 10% PONV in the TEAS group compared with 26% PONV in the control group, yielding a P value of 0.001. Zhang et al.[19] showed that 21% of patients experienced vomiting in the TEAS group, while 34% experienced vomiting in the control group ($P < .05$). Kim et al.[17] found a SS difference ($P < .05$) between the incidence of vomiting in the tetanus group and the control group.

Risk of Bias

The Cochrane Collaboration's tool for assessing the risk of bias defines six different categories in which RCTs exhibit bias: selection, performance, detection, attrition, reporting, and other.[26] This tool was used to assess bias in all eight RCTs and uniformly determine reliability. The risk of selection bias was low in the eight RCTs because randomization was utilized so that all participants were randomly assigned to treatment and control groups.[12-19]

Six of the eight studies were double-blind RCTs with a low risk of performance bias because both participants and researchers were blinded to allocation.[14-19] To limit performance

bias, two studies had both the control and treatment groups wear wrist bands to make the distinction between groups more difficult and enhance the reliability of blinding.[14,15] The other four groups used the same tactics by having both control and treatment groups wear electrodes, making the groups visually indistinguishable from one another.[16-19] Unulu and Kaya[12] had a high risk of performance bias because neither the patients nor anesthesiologists were blinded. The research trial began as a single-blind study with the participants blinded, but blinding of participants could not be accomplished because the treatment group wore wristbands while the control group did not.[12] This clear delineation between groups made blinding unreliable. Direkvand-Moghadam and Khosravi[13] claim to be a double-blind study, but only the acupressure treatment group received wrist bands, potentially ruining the trustworthiness of participant blinding.[13]

Detection bias is possible when the assessor knows what groups participants are in.[23] Unulu and Kaya[12] did not mention if the assessor was blinded. The anesthesiologists were aware of patient groups, and patients were unsuccessfully blinded, giving this study a high risk for detection bias. Zhang et al.[19] and Direkvand-Moghadam and Khosravi[13] had a low risk of detection bias because of blinded personnel who carried out data collection and statistical analysis. Three studies confirm that the PACU nurses collecting data were blind to group allocation; however, the studies do not explicitly state that the statisticians were blind as well.[14,16,17] Ertas et al.[15] and Chen et al.[18] report the researchers and data collectors (respectively) are blind but do not explicitly state if these personnel also conducted the statistical analysis, making detection bias inconclusive.

Attrition bias can potentially skew outcomes if too many participants drop out of one group and alter the characteristics of the data being reported.[23] Three research trials demonstrate no attrition bias because all participants completed the entirety of the study.[13,15,17] Three studies are at risk for attrition bias because patients were excluded due to deviation from the treatment group protocol.[12,15,16] In the study by Oh and Kim[14], an equal number of patients (two) from each

group refused to answer the survey, leaving all three groups with the same attrition rate. Zhang et al.[19] had seven patients drop out before randomization, but once randomized into control and treatment groups, all patients completed the study. No RCTs reported the possibility of reporting bias, so it was unable to be assessed.

DISCUSSION OF LITERATURE REVIEW

Summary of Evidence

Out of 182 articles screened, eight level-one RCTs with a total of 784 women were evaluated in this systematic review. Articles were excluded due to the wrong patient population (ex. men, women < 18 years old), wrong intervention (ex. acumassage), wrong outcomes (ex. analgesia, migraine prevention), or wrong type of study (ex. research trials still in progress). Due to this systematic review being conducted on women 18 years of age or older, results cannot be generalized to those outside of that defined population. The themes of the eight RCTs are listed below:

Decreasing PONV Using Acupressure. Two RCTs compared patients who received P6 acupressure bands to control groups without any band placed. Unulu and Kaya[12] administered antiemetics to the control group, while the experimental group received no antiemetics.[12] Postoperatively, a nausea-vomiting follow-up form was used at five intervals, and the visual analog scale (VAS) was utilized to assess nausea intensity.[12] The incidence of vomiting at the 2-4 hour interval was five patients in the acupressure group and 14 patients in the control group.[12] The VAS score maximum was 4 in the acupressure group and 9 in the control group[12]. A statistically significant reduction in PONV was experienced by the acupressure group when compared to the control group.

Direkvand-Moghadam and Khosravi[13] had three groups: a control group with no intervention, a P6 acupressure group, and a metoclopramide group. Nausea intensity was measured on a rating scale from 0 to 10 (absent to severe), and vomiting episodes were recorded based on frequency for the first six hours postoperatively.[13] Acupressure was superior in

preventing nausea, with only 20% of patients experiencing it, compared to 26% in the metoclopramide group, and 50% in the control group.[13] Vomiting prevalence was 18% in the acupressure group, 12% in the metoclopramide group, and 32% in the control group.

Decreasing PONV Using Acustimulation. Three RCTs studied the efficacy of P6 electrical stimulation in reducing PONV. Two RCTs compared P6 TEAS to a placebo band,[15,16] and the third RCT compared five different types of electrical stimulation.[17] Ertas et al.[15] and Carr et al.[16] both had experimental groups with P6 TEAS applied before surgery and left on for 24 hours postoperatively. The control groups had electrodes placed for the same time period, but no electrical stimulation was instituted.[15,16] Ertas et al.[15] measured PONV scores and the intensity of nausea using the verbal rating score (VRS) and found that VRS and PONV scores were significantly lower in the experimental group versus the control group ($P < 0.05$). Carr et al.[16] measured outcomes based on the Likert Nausea Scale, PONV occurrence on admission to PACU was in 14% in the control group and 0% in the experimental group.[16]

Kim et al.[17] compared five different modes of TEAS and their effects on PONV: (1) ulnar nerve, (2) single twitch (ST), (3) train of four (TOF), (4) double-burst stimulation (DBS), and (5) tetanus. PONV was evaluated at two intervals (6 and 24 hours) using a 3-point scale: 0 = absent PONV, 1 = nausea, 2 = vomiting.[17] When comparing the five independent variables, P6 tetanus proved to reduce PONV the most at both 6 and 24 hours.[17] Nausea and vomiting were 12% and 8% (respectively) in the tetanus group compared to 44% and 26% (respectively) in the control group.[17]

Acupressure versus Acustimulation. Oh and Kim[14] compared the incidence of PONV in three groups: a placebo group wearing a sham elastic band, an experimental group wearing a P6 acupressure band, and another experimental group wearing a P6 TEAS band. PONV was assessed in all three groups at set interludes of 0, 2, 6, and 24 hours after release from PACU using the Rhodes' Index of Nausea, Vomiting, and Retching (INVR). [14] At all intervals, patients in the TEAS group experienced the least amount of PONV. Specifically, at the two-hour interval,

the average percentage of patients requiring rescue antiemetics was 89% in the control group, 78% in the acupressure group, and 11% in the TEAS group, making these results statistically significant.[14] Both acupressure & TEAS utilization reduced PONV when compared to the control group, but TEAS was found to be the superior treatment out of the three.

P6 with Combined Acupoints to Reduce PONV. Two RCTs used electrical stimulation starting at 2Hz, then titrated up to achieve a continual twitching for 30 minutes before surgery[18,19] Chen et al.[18] compared P6 TEAS combined with acupoint, L14, to a control group in which electrodes were placed at the same locations, but no electrical stimulation was administered. Eighty-four women were monitored for 24 hours after undergoing a thyroidectomy.[18] Ten patients encountered PONV in the TEAS group, while 26 patients encountered PONV in the control group.[18] Zhang et al.[19] compared P6 TEAS combined with acupoints L14 and ST36 to a placebo group with no stimulation. PONV was measured at 10-minute intervals in the PACU on 65 women who had undergone cosmetic breast surgery.[19] In the TEAS group, 7 and 4 patients reported nausea and vomiting (respectively), and in the control group, 15 and 11 patients reported nausea and vomiting (respectively). [19] Both RCTs concluded that TEAS reduced PONV when compared to a placebo group.[18,19]

Summary of Key Points

- Two RCTs found that acupressure decreased PONV when compared to antiemetics[12,13]
- Two RCTs found that TEAS for 24 hours postoperatively reduced the incidence of PONV[15,16]
- One RCT found TEAS to be superior to acupressure in decreasing PONV[14]
- One RCT found P6 tetanus to reduce PONV the most when compared to other modes of TEAS[17]

- Two RCTs found that P6 TEAS combined with adjunct acupoints decreased PONV in women[18,19]

Limitations of the Systematic Review

Limitations of the systematic review must be addressed in order to evaluate evidence objectively. One key limitation to comparing data is that no single scale was used to assess and grade PONV. For example, some studies used a 3-point scale[17], 4-point scale[16] 5-point scale[14], or 10-point scale[12,13,15]. One study measured PONV based on if it was charted in the medical record[18], and another did not state which scale was used[19]. Another limitation is that not all studies defined the terms "nausea" and "vomiting" .[13-16,18] Without using a standardized scale or definition of terms, it is difficult to compare levels of nausea between different RCTs quantitatively.

Additionally, there was much variance in the time intervals for data collection. For example, Ertas et al.[15] measured PONV at 2, 6, 12, and 24 hours postoperatively, while Zhang et al.[19] measured PONV in 10-minute intervals postoperatively. Other studies measured PONV less frequently, like Kim et al.,[17] who measured vomiting only at 6 and 24-hour intervals. Measuring PONV at different time intervals adds a layer of variability and limits standardization.

Recommendations for Future Research

To further strengthen the evidence behind P6 acustimulation reducing PONV, future research studies should use a consistent measuring scale at defined homogenous intervals. This change will allow for a better comparison of results across different studies. Also, RCTs were accessible comparing acupressure to a control group[12,13] and separately comparing TEAS to a control group[15-17], but only one RCT was found that compared an acupressure group to a TEAS group[14]. Both acupressure and TEAS reduce PONV in women; hence more research needs to be conducted comparing and contrasting these two effective methods. Out of the three RCTs that assess TEAS, only one explores varying degrees of electrical stimulation.[17] This is not enough data to draw concrete conclusions; therefore, more research needs to be done.

Another recommendation is to disclose the cost-effectiveness of different interventions openly. Cost-containment is a significant driving force for decisions made at both non-profit and for-profit hospitals. Future RCTs should discuss the cost-effectiveness of P6 acustimulation compared to traditional antiemetics. Studies should also track if any unanticipated hospital admissions were caused by PONV, including the length of stay, stress on the hospital, and increase in cost. This valuable information will help encourage buy-in and acceptance at the business level.

CONCLUSION OF LITERATURE REVIEW

After reviewing eight RCTs extensively, statistically significant data reveals that P6 acustimulation (pressure or TEAS) reduces PONV in women 18 years of age and older. Acupressure was more effective than antiemetics in reducing PONV in women undergoing gynecological surgery and more effective than metoclopramide in preventing nausea for cesarean sections.[12,13] When comparing the two different types of P6 acustimulation discussed, TEAS was found to be more successful than pressure, decreasing rescue antiemetics by 44%. [14] Although there is no set amplitude or time interval for TEAS at P6, two other RCTs report significant success in reducing PONV when compared to placebo groups. [15,16]

Electrical stimulation to P6 is varied and broad, encompassing ST, DBS, tetanus, and TOF. Tetanus held for 5 seconds at 50mA every 10 minutes during surgery decreased PONV by a larger percentage than the control group and three other TEAS groups. P6 tetanus combined with other acupoints (L14[18] and ST36 with L14[19]) preoperatively for 30 minutes decreased PONV compared to placebo groups.

METHODOLOGY OF QUALITY IMPROVEMENT

Setting

The setting for this DNP project was Mount Sinai Medical Center (MSMC), a 672-bed hospital in Miami Beach, Florida.[27] MSMC is "Florida's largest private, independent, not for profit, teaching hospital." [27] Both certified registered nurse anesthetists (CRNAs) and

anesthesiologists provide anesthesia services in 26 operating suites, including the main operating room (OR), ambulatory surgery, cardiac cath lab, interventional radiology, obstetrics, and more.[27]

Recruitment and Participants

After obtaining approval from the Institutional Review Boards (IRB), email addresses were obtained from MSMC CRNAs and anesthesiologists. These emails remained confidential to preserve the anonymity of the participants. An email invitation was sent to participating staff on June 26, 2021, containing the pre-test, educational module, and post-test. Participation in the quality improvement project was entirely voluntary, and the target population was able to drop out at any time, for any reason. A total of eight MSMC CRNAs participated in this educational project.

Intervention and Procedures

The educational intervention aimed to increase anesthesia providers' knowledge about P6 acustimulation decreasing PONV in women 18 years of age and older. Increasing knowledge and disseminating information is a multi-step process. The proposed plan was submitted and approved by Florida International University and IRB, as well as submitted to Miami Beach Anesthesiology Associates, in which an IRB waiver was obtained. An email invitation to the educational module was distributed to CRNAs and anesthesiologists at MSMC. This link included a description of the project, consent for voluntary participation, a pre-test, an educational PowerPoint, and a post-test. A pre-test was used to assess current P6 comprehension and to determine if a knowledge gap was present. The evidence-based educational PowerPoint included a background of the problem, pitfalls of current treatment, P6 mechanism of action, RCT findings, and how P6 would benefit clinical practice. This voiceover PowerPoint allowed participants to either listen to the speaker for auditory learners or read through the PowerPoint for visual learners. The principal investigator's phone number and email address for the QI project were provided if participants had any questions, comments, or concerns. A post-test assessed if

learning had occurred and how likely participants would be to integrate P6 acustimulation into their practice.

Protection of Human Subjects

No subject identifiers were used when collecting or storing data, and no medical record data extraction was necessary to complete this project. All subjects remained anonymous throughout the entire QI project to protect the rights and privacy of all participants. Data collected was stored in a double-password-protected laptop computer.

Data Collection

Participant demographics and data from the pre-tests and post-tests were collected using Qualtrics software. Before the pre-test, participants were asked six questions to collect demographic information and one question to identify familiarity with P6 acustimulation. These questions were formatted in multiple-choice or free text. The pre-test included ten questions to determine knowledge of PONV, current treatments and side effects, P6 mechanism of action, and P6 acustimulation treatments. One attitude-based question was included to ascertain if practitioners would consider using P6 acustimulation in their practice. The post-test contained the same 11 questions to identify the amount of learning and if a practice change is possible. Both pre-test and post-test questions were formatted in either multiple-choice or true/false.

Measurement and Analysis

Participants were given two weeks to complete the survey and educational module link contained in the email. All responses were exported from Qualtrics into Excel software to compare the statistical difference between pre-test and post-test answers. This analysis will help determine practitioner perceptions of the proposed intervention and if learning occurred.

RESULTS OF QUALITY IMPROVEMENT

Pre-Test and Post-Test Sample

All eight participants that completed the pre-test also completed the post-test (n = 8, 100%). Therefore, the attrition rate was zero and there was no change between the pre-test and

post-test demographics. All of the participants had a doctorate degree and are CRNAs (n = 8, 100%). Ages of the participants were spread out with three less than 30 years old (n =3, 37.5%), three 30-39 years old (n = 3, 37.5%), one 40-49 years old (n = 1, 12.5%), and one greater than 60 years old (n=1, 12.5%). The participants gender were evenly split between female (n = 4, 50%), and male (n = 4, 50%). The most common ethnicity was Hispanic (n = 5, 62.5%), one was Caucasian (n = 1, 12.5%), one listed themselves as American (n = 1, 12.5%), and one listed themselves as other (n = 1, 12.5%). Most of these CRNAs have been in practice for 1-3 years (n = 5, 62.5%), two have been in practice for 4-20 years (n = 2, 25%), and one in practice for over 20 years (n = 1, 12.5%). The majority of participants have never had a P6 Acustimulation training (n = 7, 87.5%), while only one has (n = 1, 12.5%). The demographics are depicted in Table 3.

Table 3. Participant Demographics

Demographics	N (%)
Total Participants	8 (100%)
Education	
Doctorate Degree	8 (100%)
Age	
<30 years	3 (37.5%)
30-39	3 (37.5%)
40-49	1 (12.5%)
>60	1 (12.5%)
Gender	
Male	4 (50%)
Female	4 (50%)
Ethnicity	
Hispanic	5 (62.5%)
Caucasian	1 (12.5%)
American	1 (12.5%)
Other	1 (12.5%)
Title	
CRNA	8 (100%)
MD	0 (0%)
Years of Practice	
1-3	5 (62.5%)
4-20	2 (25%)
>20	1 (12.5%)
P6 Training	

None	7 (87.5%)
1 or more	1 (12.5%)

Pre-Test Knowledge

Eight CRNAs from MSMC completed the pre-test to evaluate their knowledge base of P6 Acustimulation and PONV treatment. Knowledge of PONV risk factors was lacking. Only 12.5% of participants knew that the incidence of PONV can be as high as 80% and that the most significant risk factor for PONV is being female. However, 100% of participants knew that the potential complications of PONV include wound dehiscence, unanticipated hospital admission, and dehydration. All participants were aware that a side effect of Zofran is QT prolongation. The majority (75%) of the CRNAs knew that P6 acustimulation is located on the forearm, and 62.5% understood the P6 mechanism of action.

Knowledge of the specifics of P6 acustimulation was mixed. All CRNAs (100%) answered true when asked if P6 acustimulation includes acupressure and TEAS. 100% of the participants also answered true when asked if P6 acustimulation decreases PONV and if TEAS decreases antiemetics by 44%. However, no CRNAs (0%) knew that tetanus was the most effective mode of TEAS. The second column in Table 4 depicts the pre-test knowledge of participants.

Post-Test Knowledge

The same eight CRNAs that completed the pre-test were identified by a randomized number and found to also have completed the post-test. After the educational intervention, the knowledge of PONV risk factors increased substantially. There was a 50% increase in knowledge on the incidence of PONV and a 37.5% increase in knowledge that the most significant risk factor for PONV is being female. While 100% of participants correctly answered what untreated PONV could lead to and the side effects of Zofran, only 87.5% of participants answered these correctly in the post-test.

Knowledge on where to physically place P6 stimulation increased by 12.5% after the educational intervention. There was no increase or decrease in knowledge regarding the mechanism of action of P6 (statistical difference 0%). All CRNAs (100%) correctly knew in both the pre and post-test that P6 acustimulation includes acupressure and TEAS.

Once again, knowledge of P6 acustimulation specifics was mixed. There was a 12.5% decrease in knowledge concerning TEAS reducing antiemetics, and that P6 acustimulation reduces PONV. However, there was a 50% increase in knowledge when identifying the most effective mode of TEAS as tetanus. Post-test knowledge and the statistical difference can be found respectively in the third and fourth columns of Table 4.

Table 4. Difference in Pre-Test and Post-Test Knowledge

Correct Responses	**Pre-Test**	**Post-Test**	**Difference**
The incidence of PONV can be as high as: **80%**	12.5%	62.5%	50%
The biggest risk factor for PONV is: **Being female**	12.5%	50%	37.5%
Untreated PONV can lead to: **All the above (wound dehiscence, unanticipated hospital admission, and dehydration)**	100%	87.5%	-12.5%
Adverse drug reactions of Ondansetron (Zofran) include: **QT prolongation**	100%	87.5%	-12.5%
P6 acustimulation is placed on what region of the body? **Forearm**	75%	87.5%	12.5%
Which of the following is incorrect regarding the mechanism of action of P6 acustimulation in preventing PONV? **Prevents afferent signals from traveling to the CTZ**	62.5%	62.5%	0%
P6 acustimulation includes acupressure and transcutaneous electrical acupoint stimulation (TEAS): **True**	100%	100%	0%
Transcutaneous electrical acupoint stimulation (TEAS): **Can reduce rescue antiemetics by 44%**	100%	87.5%	-12.5%
P6 acustimulation reduces PONV: **True**	100%	87.5%	-12.5%
What is the most effective mode of TEAS? **Tetanus**	0%	50%	50%

Perspective of Use in Practice

If the modality was offered at their facility, the participants were asked how likely they would be to use P6 acustimulation as adjunctive therapy to prevent or treat PONV. A positive correlation was found between the pre and post-test data. Pre-education, 37.5% of CRNAs said they were extremely likely to use it, while 62.5% of CRNAs were extremely likely to use it post-education. The same amount of CRNAs (n = 3 or 37.5%) was somewhat likely to use it before and after the educational intervention. 25% of participants were neither likely nor unlikely to use P6 acustimulation in the pre-test but changed their perspective to extremely likely in the post-test. Table 5 depicts the likelihood of CRNAs to use P6 acustimulation at their facility.

Table 5. Difference in Pre-Test and Post-Test Perspective of P6 Acustimulation

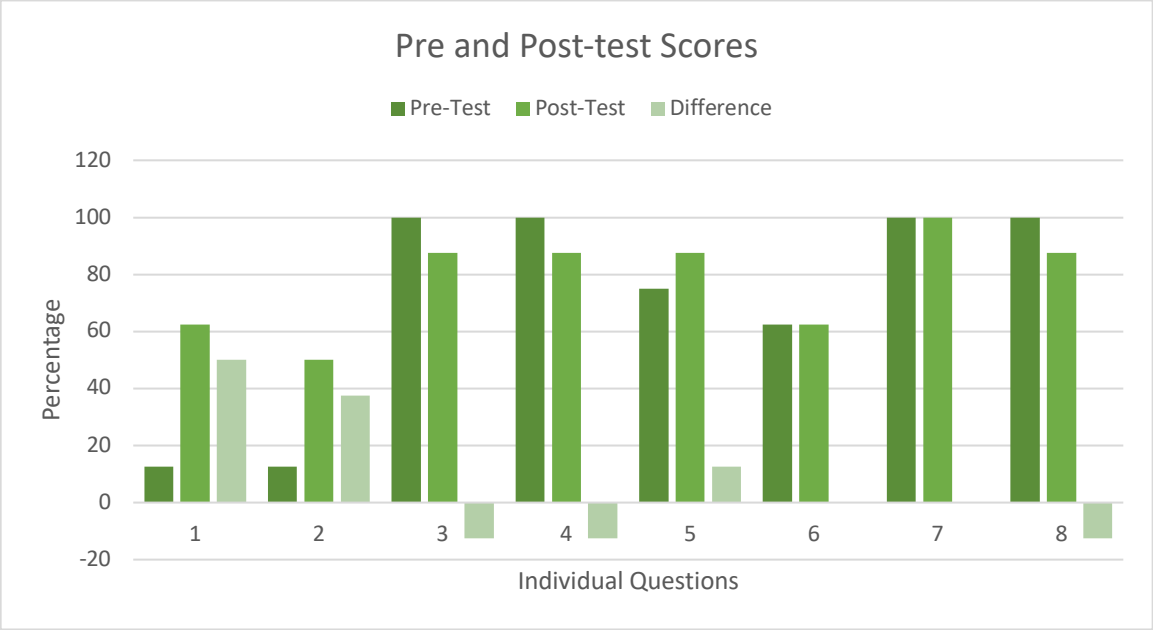
If available at your facility, how likely are you to use P6 acustimulation as adjunctive therapy to prevent or treat PONV?	PRE-TEST	POST-TEST	DIFFERENCE
Extremely Likely	37.5%	62.5%	25%
Somewhat Likely	37.5%	37.5%	0%
Neither Likely Nor Unlikely	25%	0%	-25%
Somewhat Unlikely	0%	0%	0%
Extremely Unlikely	0%	0%	0%

DISCUSSION OF QUALITY IMPROVEMENT

The results of both the pre and post-test indicate an increase in knowledge after the education module was implemented. The pre-test average was 66%, and the post-test average was 76%, yielding a 15% growth in learning. A bar graph comparing results is depicted below in Table 6. The knowledge increase coupled with the majority (62.5%) of the participants saying they would be extremely likely to use P6 acustimulation in their practice is promising. While evidence illustrates P6 acustimulation as an effective adjunct to PONV treatment, the practitioner

perspective is another vital step in the application. Making an evidence-based change in practice is an arduous and lengthy process, but this data shows that adjustment and acceptance are possible.

Table 6. Pre and Post-test scores



Limitations

Although the survey yielded positive results, a significant limitation was the small sample size. The survey was sent to 31 people, but only eight participants partook in the survey. Limited respondents could have been due to apathy in the subject matter, personal time constraints, or the inconvenience of the educational module only being viewable on a computer and not a mobile device. To improve upon this, a mobile-friendly version could be made available in the future to increase convenience to the user. Also, there were no follow-up emails after the original survey distribution; this could be another reason why so few people participated. Perhaps sending weekly reminders would have captured more participants. Another limitation was that only CRNAs took

the survey. Anesthesiologists are a vital part of care at Mount Sinai Medical Center, so it would have been beneficial to have their contribution.

Future Implications for Advanced Nursing Practice

PONV remains a problem that postsurgical patients suffer from every day. This problem has been known to cause dehydration, discomfort, and delayed discharge.[3,7] P6 acustimulation is an adjunctive, non-pharmacological treatment that can decrease PONV in hospital and ambulatory patients. Although P6 has shown to be beneficial in ameliorating PONV, there are no protocols or educational opportunities in place for its use at the intervention site. 87.5% of participants stated they have never had training on P6 acustimulation, but after the educational module, 62.5% said they were "extremely likely" to use this intervention if their facility offered it. This small sample suggests that although not widely popularized, P6 acustimulation can be widely accepted once disseminated. Due to these positive results, larger-scale P6 acustimulation QI projects involving broader participants should be implemented. More research will increase acceptance and statistical power, enhancing patient outcomes and comfort after anesthesia.

CONCLUSION

As medicine moves forward, so should the patient experience. PONV is unpleasant for the patient and can lead to postoperative complications such as delayed discharge. As the number of ambulatory surgeries increases, more control and treatment options are warranted in the arena of nausea and vomiting after anesthesia. P6 acustimulation can serve as adjunctive treatment to lessen PONV in affected patients. As of now, P6 acustimulation is not a customary mechanism of treating PONV. By implementing institution-dependent quality improvement projects, anesthetists can realize the significance of P6 acustimulation. Educating employees on its mechanism and benefits can work to ameliorate PONV in the surgical population.

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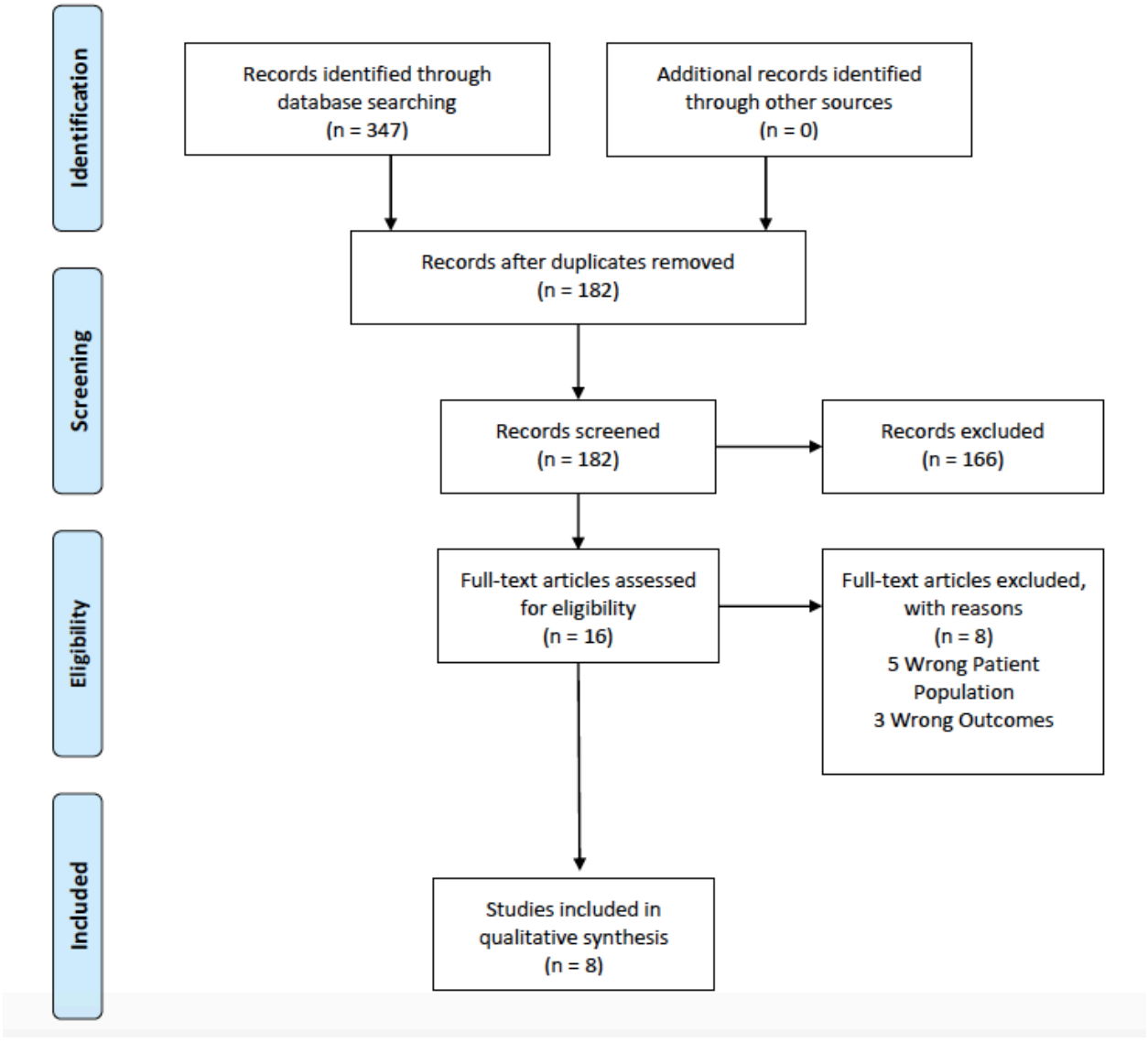
APPENDIX A: PRISMA FLOW DIAGRAM



APPENDIX B: MATRIX TABLE

Article 1

Author and Year	**Ünülü and Kaya (2018)[12]**
Design/Method	-Level 1: Experimental, RCT -Randomly assigned experimental and control group -Single-blind study: participants blinded. MDAs not blinded -Experimental group- wristband acupressure applied in first 12 hours postoperatively (postop) -Control group- received antiemetics during and after surgery, "postop clinical routine application."
Sample/Setting	-97 women aged 18-65 undergoing gynecologic surgery other than cesarean section (C-section) -Control group: n=47 -Study group: n=47 -Inclusion: 18-65 years old (y/o), gynecologic surgery with GA, no cognitive/sensory/verbal communication issues, patient volunteered -Exclusion: pacemaker (PM) present, antiemetics in past 24 hours, platinum/metal prosthesis in the arm where wristband goes, and patients having a C-section -Inclusion criteria: Longer surgical times, younger age, and history of PONV b/c they all contribute to N/V -Setting: Obstetrics hospital in Bursa, Turkey
Major Variables Studied and Their Definitions	-Independent variable 1 (IV1): application of a P6 acupressure wristband during the first 12hrs postop -Dependent Variable 1 (DV1): nausea -DV2: vomiting -DV3: comfort level
Measurement and Data Analysis	-Postoperatively, both groups were assessed for PONV using a Follow-up Form containing a 0-10 visual analog scale (VAS) & Perianesthesia Comfort Questionnaire (PCQ) at five different intervals: 0-2 hours, 2-6 hours, 6 to 12 hours, 12-24 hours, and 24-48 hours. -Vomiting was measured by the number of episodes -Did not mention blinding of the assessor
Findings	-No statistically significant difference (SSD) between age groups ($P > .05$). -Groups were similarly based on: income, type of surgery, surgical experience, history of PONV, type of anesthesia, and duration of anesthesia ($P > .05$) -No SSD between groups based on variables affecting N/V: history of motion sickness, smokers, CNS disorder, or chronic disease. -No SSD between groups on BMI or State-Trait anxiety inventory scores -DV1 (intensity of nausea) was decreased in the acupressure group according to the Visual Analog Scale (VAS) $P < .05$ -DV2 had no difference in vomiting $P >. 05$ -DV3 more comfort in study group per the PCQ $P < .05$ -Scores from different GCQ aspects showed differences between the groups that were in favor of the experimental group $P < .05$
Results	-P6 acupressure was effective at preventing vomiting & even better at preventing nausea -P6 enhanced patient comfort
Conclusions	-Because of their effectiveness and feasibility, P6 acupressure wristbands are a great alternative to pharmacologic methods in gynecologic surgery

Appraisal: Worth to Practice/Level	-Strength: both groups were controlled for confounding factors that influence PONV, ex. Age, smoking, etc. -Limitations: Within the first 12 hours postop, acupressure wristbands were applied to the experimental group due to the difficulty of obtaining the wristband. The wristband should ideally be used before surgery and stay on for 24 hours postop. -Blinding of patients could not be accomplished
THEME	-Decreasing PONV with Reliefband acupressure in women undergoing gynecological surgery (excluding C-sections)

Article 2

Author and Year	**Oh and Kim (2017)[14]**
Design/Method	-Level 1: Experimental, double-blind RCT -54 women undergoing gynecologic surgery under general anesthesia -Patients & post-anesthesia care unit (PACU) nurses were both blind -1. Control group: received standard nursing care without Nei-Guan acupoint stimulation by using a single-size elastic band without a plastic button -2. Wrist band group: continuous pressure applied to the Nei-Guan acupoint using an elastic band with a small round plastic button on the inside -3. Relief band group: A clock-like battery-powered acupoint stimulation device applied TEAS at 35mA to the Nei-Guan acupoint
Sample/Setting	-54 women undergoing gynecologic surgery under general anesthesia -Relief band experimental group: n= 18 -Wrist band experimental group: n=18 -Control group: n= 18 -Inclusion criteria: (1) understood the purpose of the study and who volunteered; (2) premenopausal women, 19-65 y/o; (3) patients who selected PCA pump after surgery for a gynecologic disease; (4) ASA I or II (5) non-smokers; (6) the first surgical experience; (7) experienced at least an hour under general endotracheal anesthesia (GETA) with volatile anesthetic; (8) able to read and answer the questionnaire and communicate with the researcher. -Exclusion: (1) history of drug abuse; (2) pregnant; (3) liver and kidney diseases; (4) antiemetics within 24 hours before surgery; (5) cancer patients receiving aggressive chemotherapy; (6) delayed for over an hour recovery time because patient's condition was poor in PACU. -Setting: Yeoido St. Mary's Hospital, Seoul, between April and September 2014
Major Variables Studied and Their Definitions	-IV1: Wrist band with pressure on acupoint P6 -IV2: Relief band with electrical stimulation on acupoint P6 -DV1: Severity of PONV -DV2: Antiemetic administration frequency
Measurement and Data Analysis	-PONV assessments were performed at 0, 2, 6, and 24 hours after discharge from PACU and measured using the Rhodes' Index of Nausea, Vomiting and Retching (INVR) and by recording the frequency of patient-requested antiemetics -The number of rescue antiemetics needed was recorded -PONV was significantly lower in the relief band electrical stimulation group than in the control group ($P < .05$) at all defined intervals listed above

	-No statistically significant difference between the control group and acupressure wrist band group (P > .05) at all defined intervals listed above -On the floor, after discharge from the PACU, 17 patients (94.4%) in the control group, 17 in the wrist band group, and 9 (50%) in the relief band group were given an antiemetic -Within 2 hours after discharge from the PACU, antiemetics were administered to 16 patients (88.9%) in the control group, 14 (77.8%) in the wrist band group, and two (11.1%) in the relief band group. -Antiemetics were given more frequently in the control and wrist band groups compared to the relief group, and the difference was statistically significant -Did not mention blinding of the assessor
Findings	The relief band electrical stimulation reduced the severity of PONV and the need for antiemetics within the first 24 hours postoperatively greater than the wrist band acupressure and control group
Results	The severity of nausea and vomiting within 24 hours after discharge remained high in the control group, but it gradually reduced over time in the relief band group. This suggests that a relief band can be used as an effective nonpharmacologic nursing intervention to reduce nausea and vomiting
Conclusions	The results support using a relief band when compared with a wrist band and with a control group to reduce PONV in women after gynecologic surgery.
Appraisal: Worth to Practice/Level	Limitations: PONV effectiveness was measured for only 24 hours in gynecologic surgical patients. Most gynecologic surgery patients under general anesthesia stay on PCA for two days to control acute surgical pain. Further studies are recommended to observe the effects of Nei-Guan acupuncture point stimulation for a more extended period, ex. The entire length of hospital stays after surgery. Another limitation- focused on women who were at risk for PONV. Because of this, we could not generalize these findings. To confirm these results, further studies using various groups such as under spinal anesthesia or epidural analgesia for pain relief and larger samples are recommended to assess the effectiveness of Nei-Guan acupuncture point stimulation.
THEME	Acustimulation is superior to the control group and acupressure group for PONV after gynecologic surgery

Article 3

Author and Year	**Ertas et al. (2015)[15]**
Design/Method	-Level 1: Experimental double-blind RCT -Randomly assigned into an intervention & control group -Intervention group (RB Group)- P6 ReliefBand with two metal electrodes at 3Hz was applied to the dominant arm 15 to 30 minutes before surgery, activated before induction, and left on for 24 hours postop. -Control group (S Group)- Sham ReliefBand (with the electrodes wrapped in plastic inhibiting their use) was applied to the dominant arm 15 to 30 minutes before surgery and remained inactivated for 24 hours postop
Sample/Setting	-62 women undergoing gynecological laparoscopy surgery aged 18 to 50y/o -Inclusion criteria: ASA 1 or 2 -Exclusion criteria: nausea and vomiting within 24 hours before surgery and use of antiemetics or glucocorticoids during this period, PM or Automatic

	Implantable Cardioverter Defibrillator (AICD), pregnant/nursing, BMI >35, serious systemic diseases, CNS injury, vertebrobasilar artery insufficiency, vestibular system disease, and those switched from laparoscopic to laparotomy. -sample size sufficient "with a statistical power of 85% and a 95% confidence interval
Major Variables Studied and Their Definitions	-IV1: P6 acustimulation via 3Hz Reliefband vs no acustimulation -DV1: PONV -DV2: number of patients who received rescue antiemetics -DV3: patient satisfaction
Measurement and Data Analysis	-Data was collected using three questionnaires with numerical ratings and then analyzed by finding the mean, median, and standard deviation -VAS measured pain 0 - 10 -VRS measured nausea severity (0 = none;1 = nausea; 2 = retching; 3 = vomiting) evaluated postop at 15 minutes and at 2, 6, 12, and 24 hours - Apfel for four risk factors: (history of motion sickness or PONV, nonsmoking, postop opioids, and female), with 1 point assigned for each -vital signs, nausea scale (VRS), pain scale (VAS), PONV score, rescue antiemetics, analgesic requirements, adverse effects, and satisfaction scores in the first 24 hours were recorded
Findings	-In the S group, the VRS (nausea) scores estimated at 30, 60, 105, and 120 minutes and 6 hours were statistically significantly higher than those in the RB group $P < .05$ -PONV scores of the S group estimated at 15 minutes and 6 and 12 hours were statistically significantly higher than those of the RB group -VRS scores of patients with higher Apfel scores (3-4) were statistically significantly lower in the RB group at 60, 75, 90, 105, and 120 minutes and 6 hours than in the S group -Higher patient satisfaction was reported in the RB group
Results	Acustimulation with P6 ReliefBand decreased severity of nausea, PONV scores, and antiemetic requirements in early postop for gynecological laparoscopy patients: -The verbal rating scale (VRS) scores in early postop and 6 hours postop were significantly higher in the RB group than in the S group. -PONV scores at 15 min and 6 and 12 hours postop were significantly higher in the S group -VRS scores of the patients with higher Apfel risk scores (3 or 4 points) in early postop and 6 hours postop were significantly lower in the RB group than in the S group. -PONV scores of patients with high Apfel risk scores at 15 minutes and 6 and 12 hours postop were significantly lower in the RB group than in the S group. - The number of patients and doses of antiemetics required was significantly lower in the RB group than in the S group. -satisfaction scores were significantly higher in the RB group.
Conclusions	P6 ReliefBand acustimulation in patients undergoing gynecological laparoscopy decreased the severity of nausea, PONV, and the use of rescue antiemetics.
Appraisal: Worth to Practice/Level	-Strength: acupoint stimulation is a noninvasive, safe, well-studied, easy-to-use, and effective treatment alternative. No adverse effects of the RB -Limitations: In the RB group, the patients felt the electrical stimulation & the S group felt no stimulation, thereby compromising the blind design of the study. In attempts to ameliorate this, patients in both groups were told they may or may not

	feel electrical stimuli. The lack of another control group made it impossible to prevent a placebo effect, which might be caused by an actual physiological effect.
THEME	Acustimulation (Hz) decreases PONV and antiemetic requirements in early postop for gynecological laparoscopy patients

Article 4

Author and Year	**Carr et al. (2015)[16]**
Design/Method	-Level 1: Experimental double-blind RCT -Patients and PACU nurses were both blinded -Both groups had one electrode placed on P6 and a second electrode over the ulnar nerve preoperatively - Treatment Group A- One electrode was placed on P6 and a second electrode over the ulnar nerve. Immediately after induction, P6 electrical stimulation was started at 5 on a 1 to 9 scale with a single twitch (ST) frequency every 8 seconds and an output current of 15 to 20 mA. -Control Group B: One electrode was placed on P6 and a second electrode over the ulnar nerve, but no electrical stimulation was instituted -PONV was measured on admission to PACU, at 30 and 60 minutes, at discharge from PACU, and two points at home up to 6 hours and between 6 and 24 hours. -Unaware of group assignment, the PACU RN assessed PONV using the Likert Nausea Scale and treated PONV as ordered on the standard Post Anesthesia Order Sheet.
Sample/Setting	-56 females, 18 to 67y/o, undergoing laparoscopic cholecystectomy -Treatment Group A: n = 29 -Control Group B: n =27 -Inclusion criteria: ASA 1 or 2, nonsmoking, and English speaking -Exclusion criteria: nausea already present preop, antiemetics taken within 24 hours of surgery, history of alcohol or drug abuse, pregnant, or surgeries > 90 minutes -There were no significant differences in ASA class or history of nausea, vomiting, or motion sickness between treatment and control groups. -Setting: A community hospital in Winter Haven, Florida, between November 2010 and March 2013
Major Variables Studied and Their Definitions	-IV1: P6 stimulation -DV1: PONV
Measurement and Data Analysis	-Patients were evaluated and ranked their nausea on a Likert Nausea Scale -Administration of antiemetics was recorded A P value of <.05 was taken as significant.
Findings	-The P6 group had a statistically significant lower incidence of PONV, 0%, vs. 14.3% in the control group (P< .05) on admission to the PACU. -31% of the P6 group had PONV in PACU or at home compared with 51.9% in the control group.
Results	-4 patients in the control group and none in the treatment group experienced PONV on admission to the PACU (P < .05) -These results support using P6 electrostimulation in this population
Conclusions	P6 stimulation in the perioperative arena is clinically meaningful

Appraisal: Worth to Practice/Level	-Limitations: 100 participants were anticipated, but only 56 enrolled due to unforeseen factors such as robotic surgery becoming popular, limiting the number of patients for laparoscopic cholecystectomies
THEME	Acustimulation reduces PONV in women undergoing laparoscopic cholecystectomies

Article 5

Author and Year	**Chen et al. (2015)[18]**
Design/Method	-Level 1: Double-blind RCT -The patients, attending anesthesiologist, surgeons, and data collector were blinded -Treatment group: received 2/10Hz of transcutaneous electric acupoint stimulation (TEAS) at bilateral Hegu (LI4) and Neiguan (PC6) in the preop area for 30 minutes. The intensity of 2Hz was adjusted to maintain a slight twitching. -Control group: The same stimulator was applied but remained off so that no electrical stimulation was given
Sample/Setting	-84 females, 18 to 60y/o undergoing thyroidectomy -Control group: n = 42 -Treatment group: n = 42 -Inclusion criteria: ASA I or II patients -Exclusion criteria: potentially difficult airway, chronic pain, drug or alcohol abuse, mental disorder, intake of any analgesic within 48 hours before surgery, previous acupuncture treatment -Setting: Fujian Provincial Hospital from January 2015 to May 2015
Major Variables Studied and Their Definitions	-IV1: TEAS -DV1: Quality of recovery -DV2: PONV -DV3: Postop pain -DV4: Duration of PACU stay -DV5: Patient satisfaction
Measurement and Data Analysis	-A patient was considered to suffer from PONV if nausea or vomiting was documented 24 hours after surgery -10 pts had PONV in the TEAS group -26 pts had PONV in the control group -P-value 0.001
Findings	-Preoperative TEAS can attenuate PONV -The presence of PONV reduces patient comfort and can cause postsurgical complications, such as aspiration, suture dehiscence, and bleeding, which may delay discharge or result in hospital admission.
Results	-TEAS reduced PONV, dizziness ($P = 0.001$), and duration of PACU stay ($P < 0.001$). -Patient satisfaction was higher in the TEAS group ($P = 0.002$).
Conclusions	-Preoperative TEAS enhance the quality of recovery, postop analgesia, patient satisfaction, alleviates postop side effects, and accelerates discharge after general anesthesia for thyroidectomy
Appraisal: Worth to Practice/Level	-Strengths: TEAS has no risk of broken needles, low incidence of procedural pain and contamination. It can be applied widely with minimal training. The 2 Hz electrical stimulation alleviates pain and PONV -Limitations: P6 stimulation was combined with LI4 stimulation

THEME	Decreased PONV with use of P6 and LI4 electric acustimulation, 2Hz

Article 6

Author and Year	**Zhang et al. (2014)[19]**
Design/Method	-Level 1: Double-blind placebo-controlled RCT -Randomly assigned TEAS and sham group -TEAS group- received 30 minutes of electrical stimulation 2Hz at three acupoints [bilateral Hegu (LI4); Neiguan (PC6); and Zusanli (ST36)] on the hand and forearm before induction of general anesthesia. The optimal intensity was adjusted to maintain a slight twitching of the regional muscle according to individual maximum tolerance. -Sham group- Placebo gel electrodes were applied to the same acupressure points, but electric stimulation was not applied
Sample/Setting	-65 women, 20– 50 y/o undergoing elective cosmetic breast surgery -TEAS group: n = 33 -Control group: n = 32 -Inclusion criteria: ASA 1 or 2 -Exclusion criteria: heart, lung, liver, kidney or endocrine system disease; mental disorder, sore throat; obesity; potentially difficult airway; or previous acupuncture -Setting: Xijing Hospital at the Fourth Military Medical University, between July and December 2012
Major Variables Studied and Their Definitions	-IV1: TEAS to LI4, PC6, and ST36 -DV1: recovery room duration of stay -DV2: anesthetic consumption -DV3: time to removal of LMA -DV4: time to reorientation and postop side-effects (incidence of respiratory depression, nausea, vomiting, dizziness, and pruritus) -Nausea- a subjectively unpleasant sensation associated with awareness of the urge to vomit -Vomiting- forceful expulsion of gastric contents from the mouth brought about by powerful sustained contraction of abdominal muscles
Measurement and Data Analysis	-Nausea and vomiting were assessed in PACU at 10-min intervals
Findings	-Nausea: 7 in the TEAS group and 15 in the Sham group -Vomiting: 4 in TEAS group and 11 in the Sham group
Results	-Dizziness, pruritus, nausea, and vomiting were all significantly lower in the TEAS group
Conclusions	-Preoperative TEAS helps shorten PACU stay and improves the quality of recovery after general anesthesia for outpatient surgery.
Appraisal: Worth to Practice/Level	-Strengths: adequate blinding, standardized TEAS, and anesthesia protocols. TEAS is noninvasive, with no risk of infections or needle-induced contagious disease and reduced fear of stimulation. It can be applied by any anesthetist or preop personnel with minimal training. -Limitations: it was not possible to blind acupuncturists to treatment. The patients collected are from a single center, so large-scale multicenter clinical trials are still needed.
THEME	TEAS to bilateral Hegu LI4, Neiguan PC6, and Zusanli ST36 reduce PONV

Article 7

Author and Year	**Kim et al. (2011)[17]**
Design/Method	-Level 1: Double-blind, RCT -Randomly assigned to one of five groups: 1. Control, 2. Single twitch (ST), 3. Train of four (TOF), 4. Double-burst stimulation (DBS), 5. Tetanus -Control group: 2 surface electrodes were placed over the ulnar nerve on the dominant arm before induction and removed after anesthesia in the OR. The proximal positive electrode was placed 3 cm proximal to the distal negative electrode and connected to a peripheral nerve stimulator. 1Hz, 50mA ST stimulation was given throughout the case -Treatment groups: (ST, TOF, DBS, or tetanus)- electrodes were used to stimulate the median nerve at the P6 acupoint on the dominant arm before induction and removed after anesthesia in the OR. The proximal positive electrode was placed between the tendons of the palmaris longus and the flexor carpi radialis 1 cm proximal to the P6 acupoint. The distal negative electrode was placed 2 cm distal to the P6 acupoint. -The risk for PONV was evaluated with a simplified Apfel score. -Vomiting, retching, and other symptoms were assessed at 6 and 24 hours -PONV was assessed on a 3-point scale: 0 =no symptoms, 1 = only nausea, 2 = vomiting. -Ondansetron 4 mg was administered IV to any patient who experienced an episode of severe nausea, vomiting, or who requested the medication
Sample/Setting	-264 women, 31 to 67 y/o undergoing laparoscopic hysterectomy -Control group: n = 54 -ST group: n = 52 -TOF group: n = 53 -DBS group: n = 53 -Tetanus group: n = 52 -Inclusion criteria: ASA 1 or 2 -Exclusion criteria- antiemetics within 24 hours of surgery; obesity (weight >130% of IBW); neuromuscular, hepatic, or renal diseases; or history of allergies to the meds used during anesthesia. -Setting: Hanyang University Hospital in South Korea
Major Variables Studied and Their Definitions	-IV1: Ulnar nerve stimulation -IV2: ST stimulation of P6 -IV3: TOF stimulation of P6 -IV4: DBS of P6 -IV5: Tetanus of P6 -DV1: Nausea -DV2: Vomiting -DV3: Retching -DV4: Pain -Nausea: the desire to vomit without the presence of expulsive muscular movements -Vomiting: forceful expulsion of gastric contents from the mouth -Retching: active attempt to vomit without expulsion of gastric contents
Measurement and Data Analysis	-PONV was 70% in the control group and 49% in the treatment group

Findings	-In the first 6 hours postop, the incidence of PONV was significantly lower in the tetanus group (15.4%) compared to the ST (40.4%), TOF (37.7%), DBS (26.4%), and control group (53.7%) (P = 0.022). -Overall satisfaction scores on PONV management were significantly higher in the tetanus group compared with the control group
Results	-PONV was significantly reduced (P = 0.022) 6 hours after tetanic stimulation in the treatment group compared to the control group -The tetanus group was more satisfied with the management of PONV compared to patients in the control group
Conclusions	-Tetanic stimulation applied at the P6 acupoint reduced the incidence of PONV in the first 6 hours after laparoscopic hysterectomy and increased patient satisfaction compared with the control treatment of ST stimulation of the ulnar nerve
Appraisal: Worth to Practice/Level	-Limitations: Did not control for PONV risk factors. The large variability in the control event rate of PONV may be attributable to differences in the study population (female gender, nonsmoking status, history of PONV or motion sickness, lengthy or emetogenic surgery, administration of nitrous oxide, volatile anesthetics, or postoperative opioids). Results lacked the sensitivity to detect an antiemetic effect because they did not use a verbal rating scale with 0 = none to 10 = worst imaginable to evaluate the severity of nausea and vomiting, and it was difficult to administer tetanus every 10 minutes during the duration of the study
THEME	Compares four different types of P6 electric stimulation to a control group of ulnar nerve electric stimulation. P6 tetanus is superior in preventing PONV

Article 8

Author and Year	**Direkvand-Moghadam & Khosravi. (2013)[13]**
Design/Method	-Level 1: double-blind RCT -Randomly assigned to one of three groups. All groups were matched for influential factors on nausea and vomiting in inclusion and exclusion criteria. -Control group- did not receive any intervention -Second group- received 10 mg Metoclopramide IV immediately before induction -Third group- Acupressure bands were applied to P6 on both wrists 15 minutes before induction. Bands were removed 6hrs after induction -Intra and postop emetic episodes were recorded by a trained investigator.
Sample/Setting	-102 women,18 to 35 y/o undergoing elective C/S -Control group: n = 34 -Second group: n = 34 -Third group: n = 34 -Inclusion criteria- ASA 1 or 2, gestational ages 38-40 weeks, normal fetal heart rates at the first to fourth pregnancies, and no history of a previous abdominal surgery -Exclusion criteria- preop opioid use, acute or chronic diseases associated with nausea and vomiting, carpal tunnel syndrome, < 50 kg or > 100 kg, digestive and ear disorders. -Setting: Gynecology Division of Mustafa University Hospital of Ilam, West of Iran between September 29, 2011, to October 23, 2012
Major Variables Studied and Their Definitions	-IV1: No intervention -IV2: Metoclopramide -IV3: P6 acupressure -DV1: Nausea

	-DV2: Vomiting
Measurement and Data Analysis	-Severity of nausea was evaluated on a numeric scale from 0 to 10 (no nausea: 0; mild nausea: 1–3; moderate nausea: 4–7; severe nausea: 8–10) -Number of vomiting episodes in the 6 hours after surgery and frequencies of antiemetic requirements were recorded. -Data collection was carried out by someone who did not know the plan of the study, and the biostatistician was blinded
Findings	-The incidence of vomiting during recovery was 32.34 % (11 out of 34) in the placebo group, 11.76 % (4 out of 34) in the metoclopramide group, and 17.64 % (6 out of 34) in the acupressure group -About 60 minutes after surgery, the mean severity of nausea in the placebo group was 7.48 ± 0.69, in the metoclopramide group, it was 3.31± 0.45, and in the acupressure group, it was 4.17± 1.15
Results	-The incidence of PONV was lower in Metoclopramide and Acupressure groups compared to the control group. The frequency of antiemetics was significantly higher in the control group compared to the other groups ($p < 0.001$)
Conclusions	-In parturients who underwent C-sections with spinal anesthesia, metoclopramide and acupressure were found to be equally effective for reducing emetic symptoms (nausea, retching, and vomiting).
Appraisal: Worth to Practice/Level	-Strength: No side effects were experienced in either experimental groups -Limitations: not listed
THEME	Acupressure and metoclopramide are equally as effective in reducing PONV in parturients undergoing C-sections with spinal anesthesia

APPENDIX C: IRB EXEMPTION

FIU | FLORIDA INTERNATIONAL UNIVERSITY

Office of Research Integrity
Research Compliance, MARC 414

MEMORANDUM

To:	Dr. Yasmine Campbell
CC:	Karina Grubbs
From:	Elizabeth Juhasz, Ph.D., IRB Coordinator EJ
Date:	April 7, 2021
Protocol Title:	**"Educational Intervention Regarding the Utilization of P6 Acustimulation to Decrease PONV in Women 18 Years of Age and Older: A Quality Improvement Project"**

The Florida International University Office of Research Integrity has reviewed your research study for the use of human subjects and deemed it Exempt via the **Exempt Review** process.

IRB Protocol Exemption #: IRB-21-0128 **IRB Exemption Date:** 04/07/21
TOPAZ Reference #: 110192

As a requirement of IRB Exemption you are required to:

1) Submit an IRB Exempt Amendment Form for all proposed additions or changes in the procedures involving human subjects. All additions and changes must be reviewed and approved prior to implementation.
2) Promptly submit an IRB Exempt Event Report Form for every serious or unusual or unanticipated adverse event, problems with the rights or welfare of the human subjects, and/or deviations from the approved protocol.
3) Submit an IRB Exempt Project Completion Report Form when the study is finished or discontinued.

Special Conditions: N/A

For further information, you may visit the IRB website at http://research.fiu.edu/irb.

EJ

APPENDIX D: MBAA WAIVER

Re: IRB Waivers for Quality Improvement Projects with Miami Beach Anesthesiology Associates

The following students have proposed some interdepartmental education modules. These quality improvement projects are internal projects belonging to Miami Beach Anesthesiology Associates. Internal review board approval is not necessary for our departmental improvement projects per Mount Sinai Medical Center's advocate, Yvonne Ortiz.

The projects will involve surveying anesthesia providers from Miami Beach Anesthesiology Associates at Mount Sinai Medical Center of Florida.
Then **educational modules** performed by the students will be giving a pre-test, recorded educational module with a post-test lasting less than 20 minutes.

The following project has been proposed and approved by our educational department and deem these projects IRB exempt.

Karina Grubbs: An Educational Intervention Regarding the Utilization of P6 Acustimulation to Decrease PONV in Women 18 Years of Age and Older: A Quality Improvement Project

Please don't hesitate to contact our department with any questions and/or concerns

Kindly,

Gerald P. Rosen M.D., FASA
Miami Beach Anesthesiology Associates
Program Director, Anesthesiology Residency
Mount Sinai Medical Center
4300 Alton Road, Miami Beach, FL
Gerald.rosen@msmc.com
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305 469-8348

APPENDIX E: QI PROJECT CONSENT

FIU | FLORIDA INTERNATIONAL UNIVERSITY

CONSENT TO PARTICIPATE IN A QUALITY IMPROVEMENT PROJECT
"An Educational Module for the Utilization of P6 Acustimulation to Decrease PONV in Women 18 years of Age and Older"

PURPOSE OF THE PROJECT

The goal of this project is to decrease postoperative nausea and vomiting (PONV) using P6 acustimulation in women greater than 18 years old through an educational intervention targeting certified registered nurse anesthetists (CRNAs). You are being asked to participate in this quality improvement project

DURATION OF THE PROJECT

This will require about 20 minutes of your time.

PROCEDURES

If you agree to be in the project, we will ask you to do the following things: take a pre-test, listen or read through an educational module, and complete a post-test.

RISKS AND/OR DISCOMFORTS

There are no foreseeable risks with you for participating in this project.

BENEFITS

The following benefits with your participation in this project: An increase in your knowledge surrounding the pathophysiology of PONV, traditional antiemetics, and how P6 acustimulation can decrease PONV.

ALTERNATIVES

There are no known alternatives available to you other than not taking part in this project. However, if you like to receive the educational material given to the participants in this project, it will be provided to you at no cost.

CONFIDENTIALITY

The records of this project will be kept private and will be protected to the fullest extent provided by law. When publishing data, we will not include any information that will make it possible to identify you as a participant because the survey results are anonymous. Records will be stored securely, and only the project team will have access to the records.

COMPENSATION & COSTS

There is no cost or payment to you for receiving the health education and/or participating in this project.

RIGHT TO DECLINE OR WITHDRAW

Your participation in this project is voluntary. You are free to participate in the project or withdraw your consent at any time during the project. Your withdrawal or lack of participation will not affect any benefits to which you are otherwise entitled. The investigator reserves the right to remove you without your consent at such time that they feel it is in the best interest.

RESEARCHER CONTACT INFORMATION

If you have any questions about the purpose, procedures, or any other issues relating to this research project, you may contact Karina Grubbs at 954-665-9703, Kgrub002@fiu.edu or Dr. Ann Miller at 305-348-4871, annmille@fiu.edu

IRB CONTACT INFORMATION

If you would like to talk with someone about your rights of being a subject in this project or about ethical issues with this project, you may contact the FIU Office of Research Integrity by phone at 305-348-2494 or by email at ori@fiu.edu

PARTICIPANT AGREEMENT

I consent by participating in the survey. I have read the information in this consent form and agree to participate in this project.

APPENDIX F: QI PROJECT SURVEY

Pre-test and Posttest Questionnaire: P6 Acustimulation to Reduce PONV

Introduction

The primary aim of this QI project is to improve the knowledge of anesthesia providers pertaining to P6 acustimulation, decreasing PONV in women 18 years of age and older.

Please answer the question below to the best of your ability. The questions are either in multiple-choice or true/false format and are meant to measure knowledge and perceptions on PONV treatment using P6 acustimulation.

Personal information

1. **Gender:** Male Female Other_____
2. **Age:** _____
3. **Ethnicity:**

   Hispanic Caucasian African American Asian

   Other_____
4. **Position/Title:** _____
5. **Level of Education:** Associates Bachelors Masters Other _____
6. How many trainings (in any format: in-person, online, etc.) have you attended in the **past year** that focused on PONV?

   None 1 2 3 > 3 I don't know/I don't remember

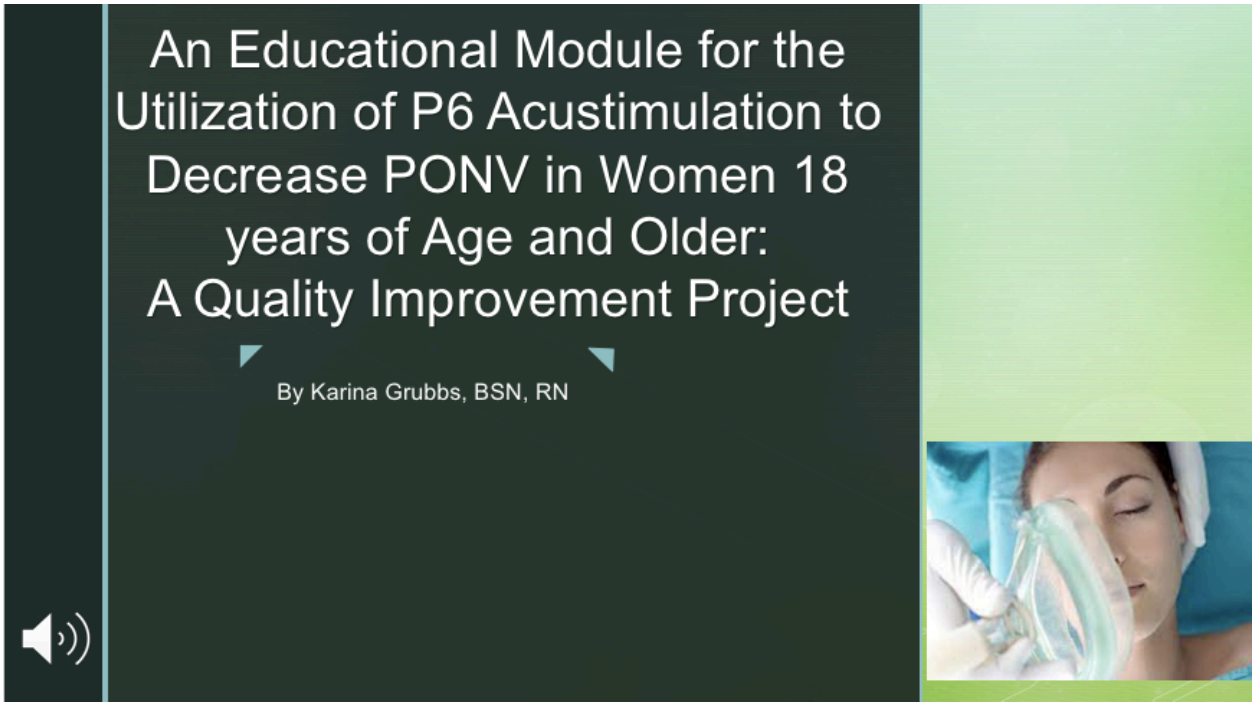
Questionnaire

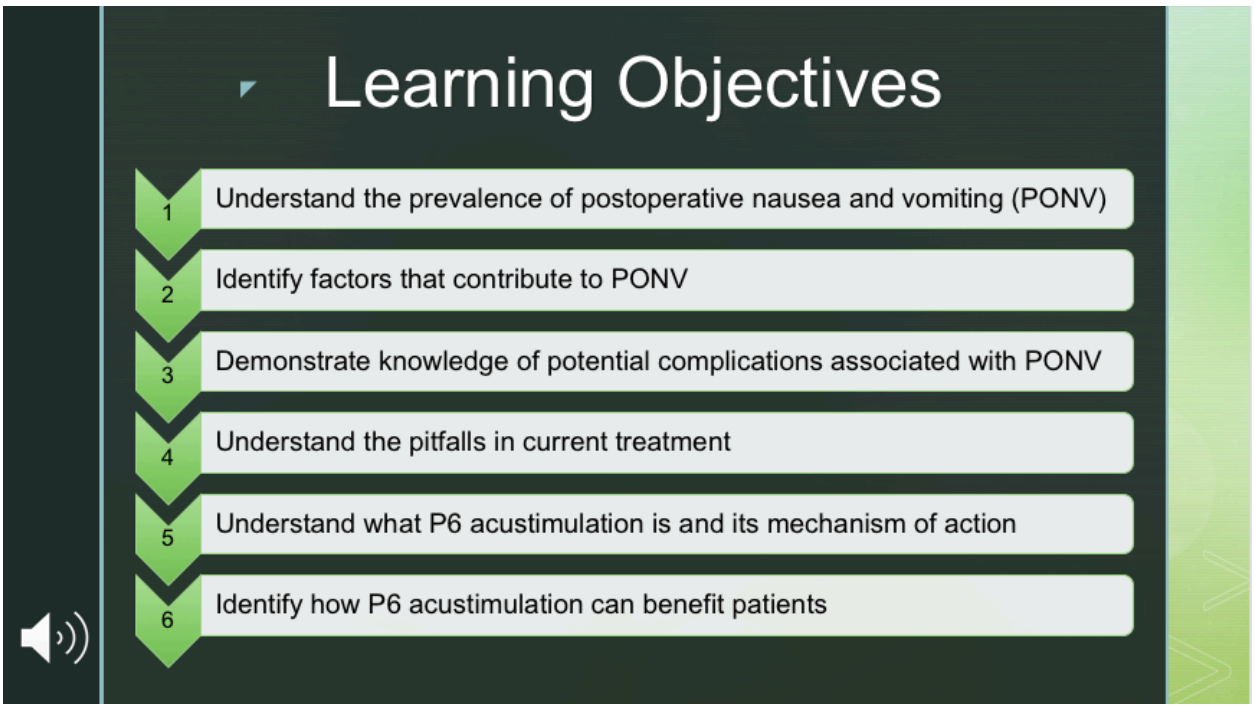
1. **Depending on patient risk factors, the incidence of PONV can be as high as:**
    a. 20%
    b. 40%
    c. 60%
    d. 80%
2. **The biggest risk factor for PONV is:**
    a. History of motion sickness
    b. Being female
    c. Age < 50 years old
    d. Obesity
3. **Untreated PONV can lead to:**
    a. Wound dehiscence
    b. Unanticipated hospital admission
    c. Aspiration
    d. Dehydration
    e. All the above
4. **Adverse drug reactions of Ondansetron (Zofran) include:**
    a. Nausea
    b. aPTT prolongation
    c. QT prolongation
    d. Hyperglycemia
5. **P6 Acustimulation is placed on what region of the body?**
    a. Forearm
    b. Calf
    c. Upper abdomen

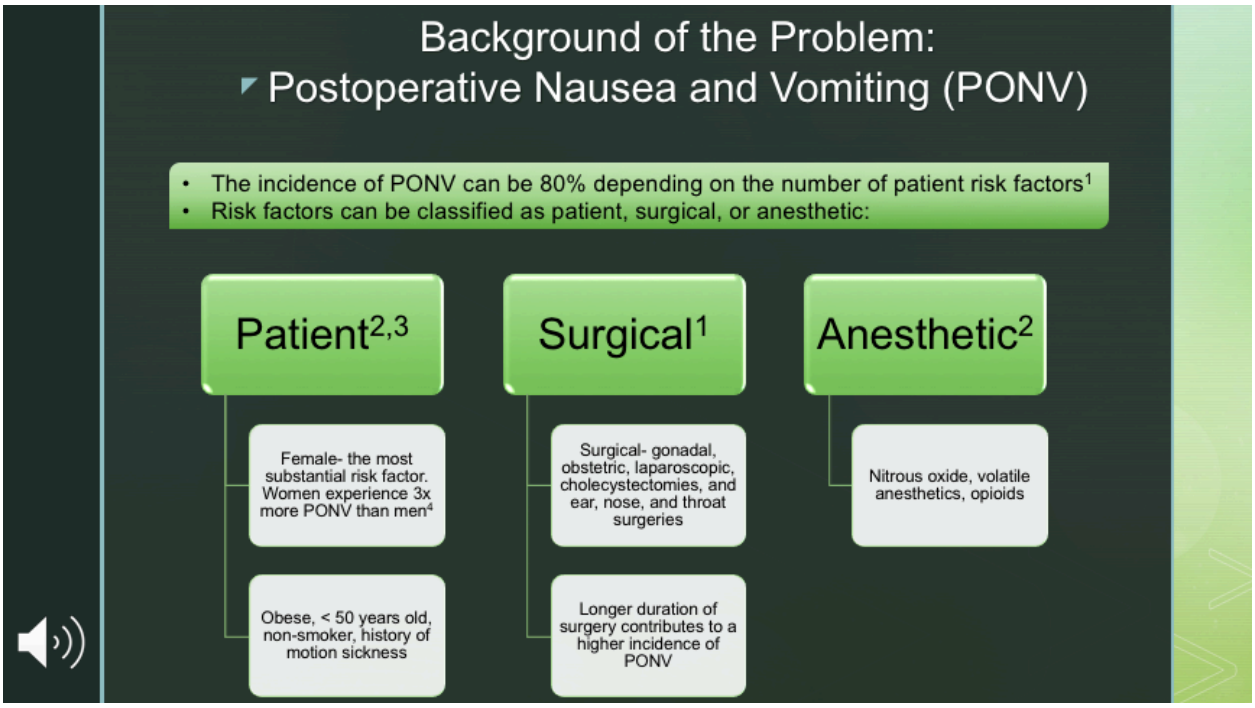
d. Temple

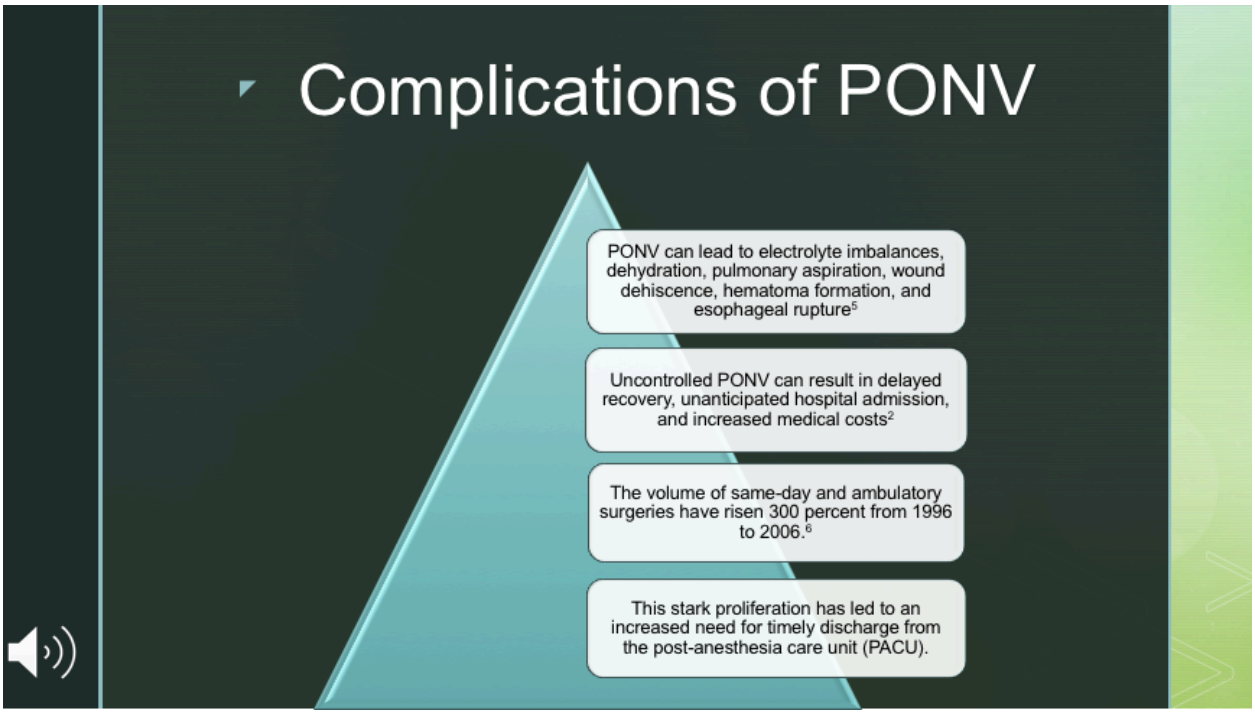
6. **Which of the following is INCORRECT regarding the mechanism of action of P6 acustimulation in preventing PONV?**
    a. Prevents afferent signals from traveling to the CTZ
    b. Increases vagal nerve firing, which increases gastric peristalsis
    c. Increases endorphin release into the CSF and alters serotonin transmission
7. **P6 acustimulation includes acupressure and Transcutaneous Electrical Acupoint Stimulation (TEAS):** True or False
8. **Transcutaneous Electrical Acupoint Stimulation (TEAS)**
    a. Is not effective
    b. Exacerbates PONV
    c. Is painful
    d. Can reduce rescue antiemetics by 44%
9. **P6 acustimulation reduces PONV:** True or False
10. **What is the most effective mode of TEAS?**
    a. Single Twitch
    b. Tetanus
    c. Train of Four
    d. Double Burst Stimulation
11. **If available at your facility, how likely are you to use P6 acustimulation as adjunctive therapy to prevent or treat PONV?**
    a. Extremely likely
    b. Somewhat likely
    c. Neither unlikely nor likely
    d. Somewhat unlikely
    e. Very unlikely

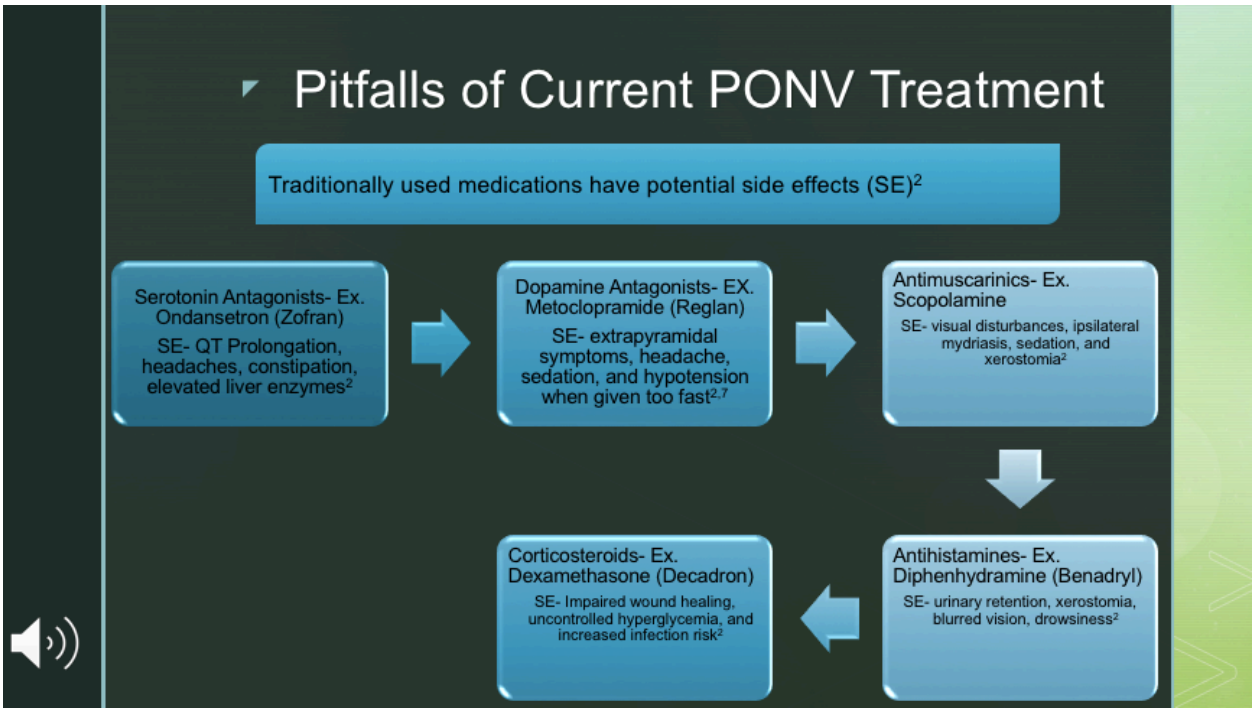
APPENDIX G: EDUCATIONAL MODULE

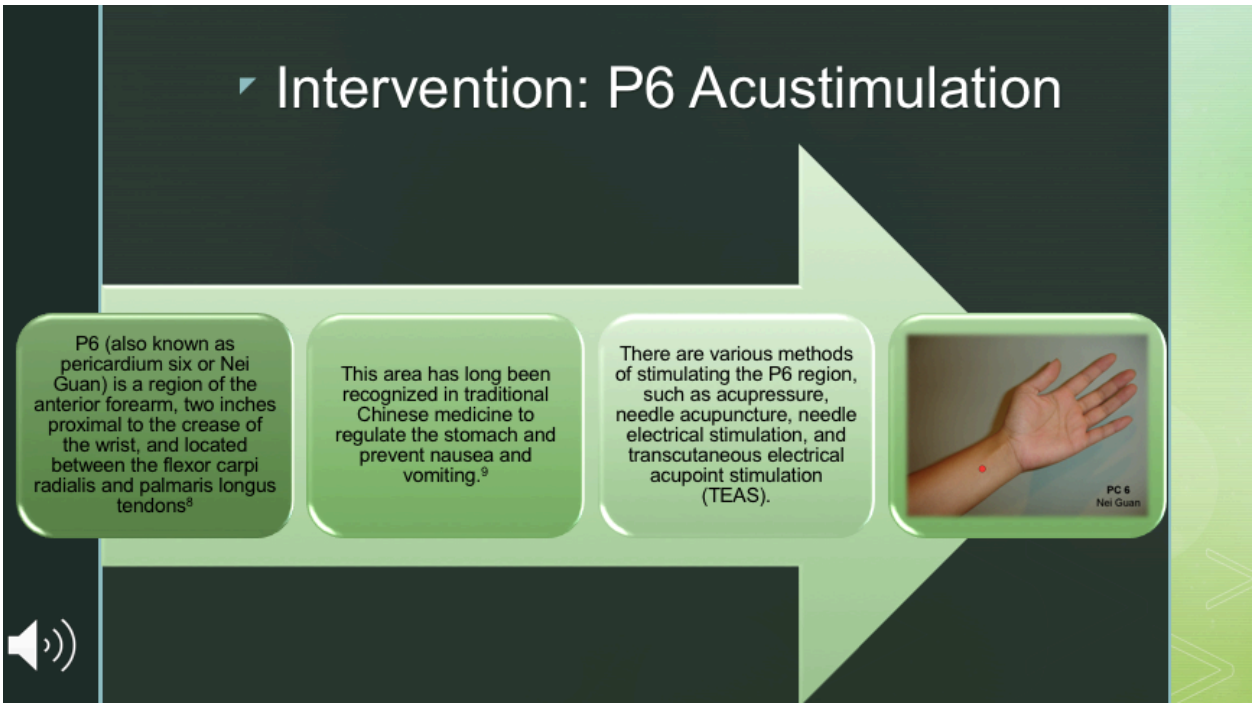


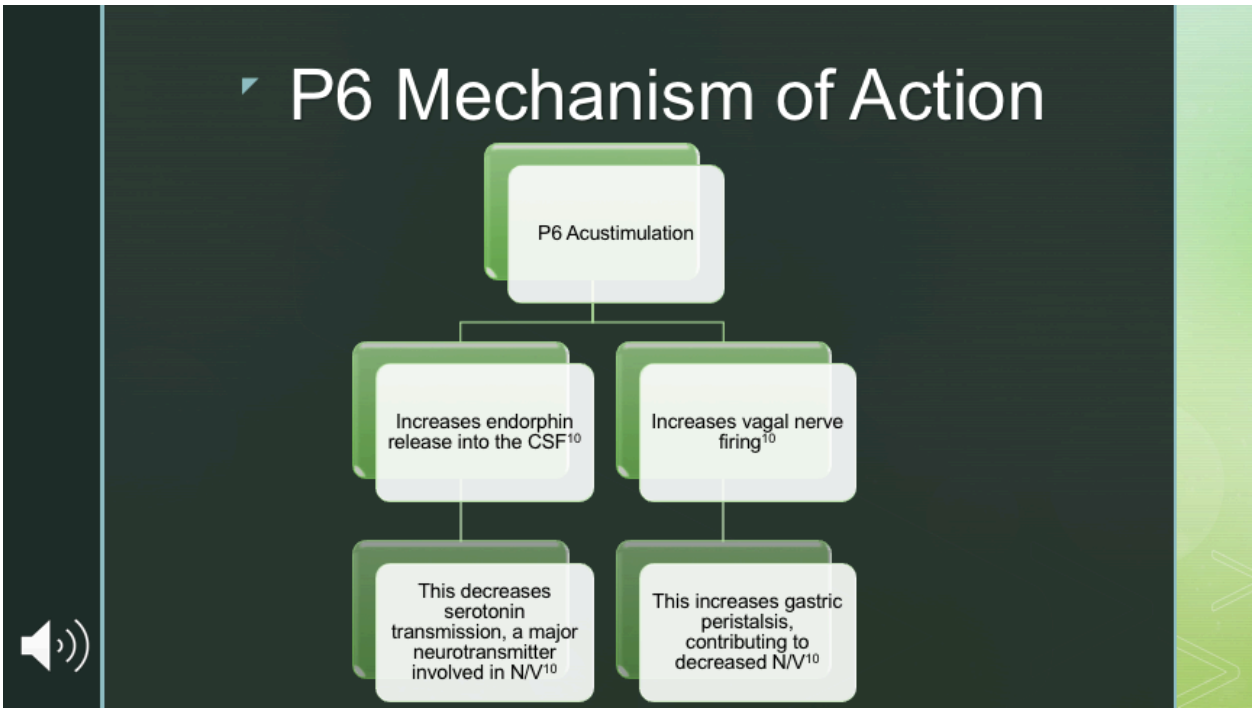


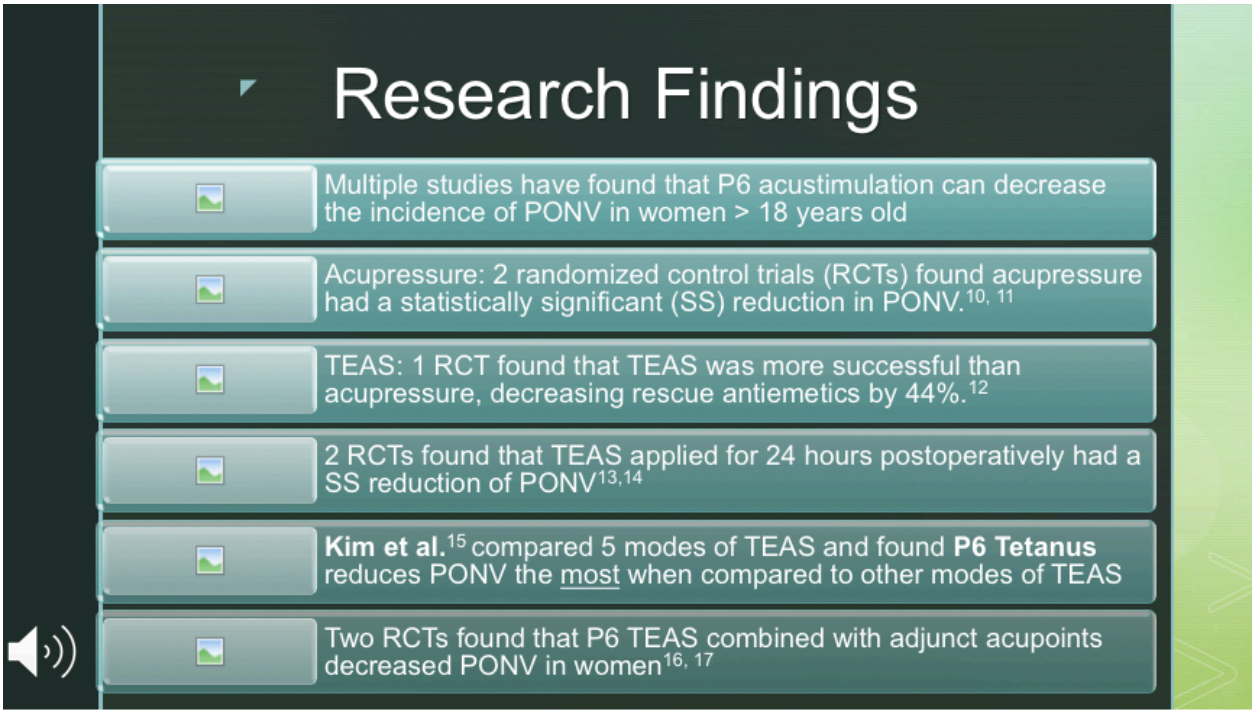

Background of the Problem:
Postoperative Nausea and Vomiting (PONV)
The incidence of PONV can be 80% depending on the number of patient risk factors[1]
Risk factors can be classified as patient, surgical, or anesthetic:
Patient[2,3]
Female- the most substantial risk factor. Women experience 3x more PONV than men[4]
Obese, < 50 years old, non-smoker, history of motion sickness
Surgical[1]
Surgical- gonadal, obstetric, laparoscopic, cholecystectomies, and ear, nose, and throat surgeries
Longer duration of surgery contributes to a higher incidence of PONV
Anesthetic[2]
Nitrous oxide, volatile anesthetics, opioids

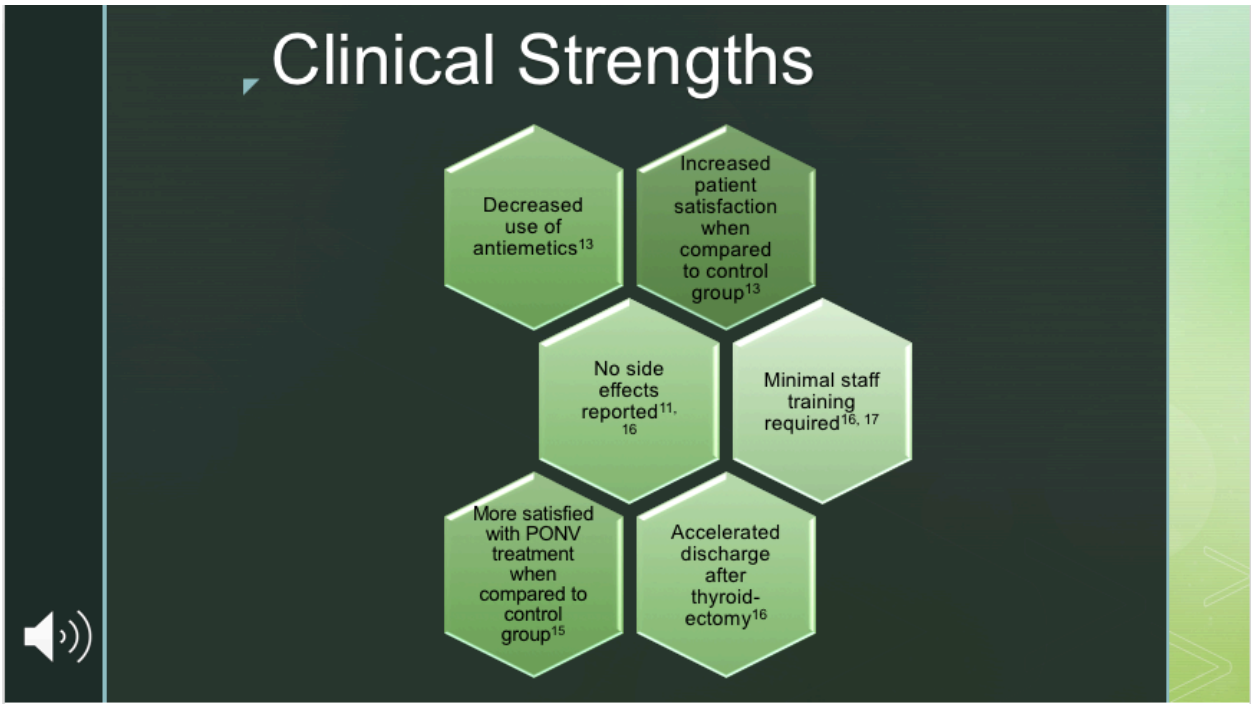

Complications of PONV
PONV can lead to electrolyte imbalances, dehydration, pulmonary aspiration, wound dehiscence, hematoma formation, and esophageal rupture[5]
Uncontrolled PONV can result in delayed recovery, unanticipated hospital admission, and increased medical costs[2]
The volume of same-day and ambulatory surgeries have risen 300 percent from 1996 to 2006.[6]
This stark proliferation has led to an increased need for timely discharge from the post-anesthesia care unit (PACU).

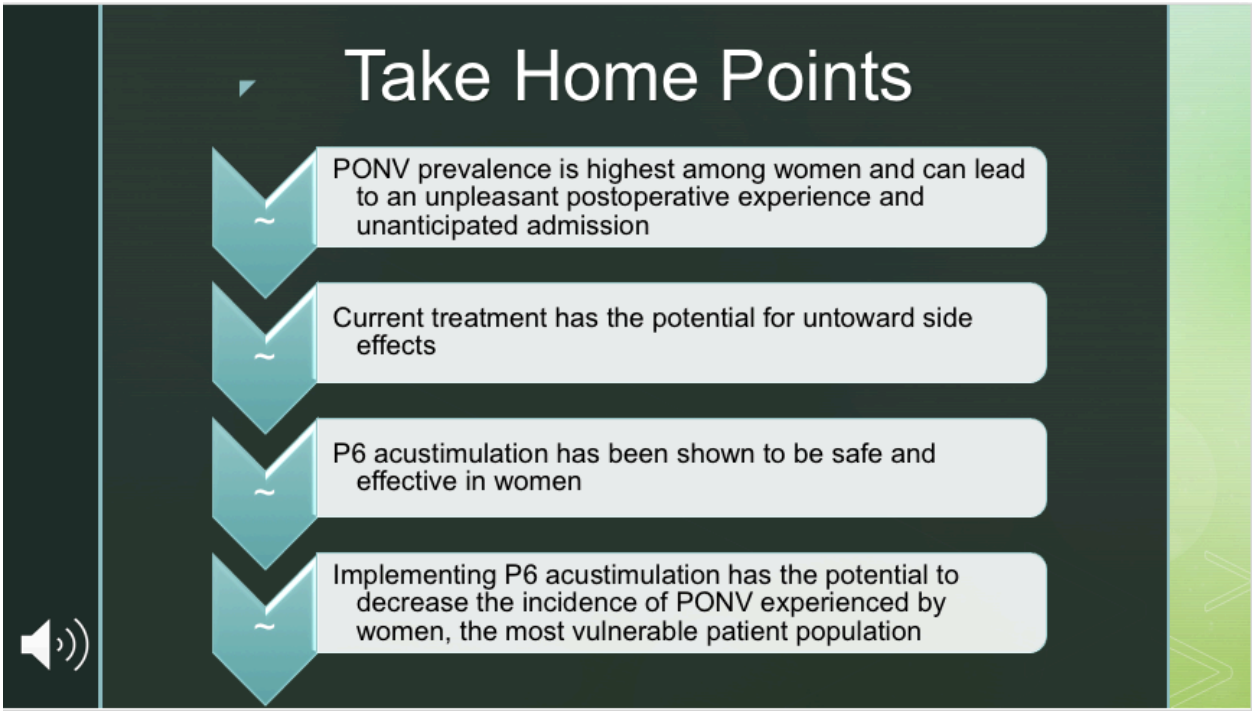

Pitfalls of Current PONV Treatment
Traditionally used medications have potential side effects (SE)[2]
Serotonin Antagonists- Ex. Ondansetron (Zofran)
SE- QT Prolongation, headaches, constipation, elevated liver enzymes[2]
Dopamine Antagonists- EX. Metoclopramide (Reglan)
SE- extrapyramidal symptoms, headache, sedation, and hypotension when given too fast[2,7]
Antimuscarinics- Ex. Scopolamine
SE- visual disturbances, ipsilateral mydriasis, sedation, and xerostomia[2]
Antihistamines- Ex. Diphenhydramine (Benadryl)
SE- urinary retention, xerostomia, blurred vision, drowsiness[2]
Corticosteroids- Ex. Dexamethasone (Decadron)
SE- Impaired wound healing, uncontrolled hyperglycemia, and increased infection risk[2]


Intervention: P6 Acustimulation
P6 (also known as pericardium six or Nei Guan) is a region of the anterior forearm, two inches proximal to the crease of the wrist, and located between the flexor carpi radialis and palmaris longus tendons[8]
This area has long been recognized in traditional Chinese medicine to regulate the stomach and prevent nausea and vomiting.[9]
There are various methods of stimulating the P6 region, such as acupressure, needle acupuncture, needle electrical stimulation, and transcutaneous electrical acupoint stimulation (TEAS).
PC 6
Nei Guan


P6 Mechanism of Action
P6 Acustimulation
Increases endorphin release into the CSF[10]
Increases vagal nerve firing[10]
This decreases serotonin transmission, a major neurotransmitter involved in N/V[10]
This increases gastric peristalsis, contributing to decreased N/V[10]


Research Findings
Multiple studies have found that P6 acustimulation can decrease the incidence of PONV in women > 18 years old
Acupressure: 2 randomized control trials (RCTs) found acupressure had a statistically significant (SS) reduction in PONV.[10, 11]
TEAS: 1 RCT found that TEAS was more successful than acupressure, decreasing rescue antiemetics by 44%.[12]
2 RCTs found that TEAS applied for 24 hours postoperatively had a SS reduction of PONV[13,14]
Kim et al.[15] compared 5 modes of TEAS and found P6 Tetanus reduces PONV the most when compared to other modes of TEAS
Two RCTs found that P6 TEAS combined with adjunct acupoints decreased PONV in women[16, 17]


Clinical Strengths
Decreased use of antiemetics[13]
Increased patient satisfaction when compared to control group[13]
No side effects reported[11, 16]
Minimal staff training required[16, 17]
More satisfied with PONV treatment when compared to control group[15]
Accelerated discharge after thyroid-ectomy[16]


Take Home Points
PONV prevalence is highest among women and can lead to an unpleasant postoperative experience and unanticipated admission
Current treatment has the potential for untoward side effects
P6 acustimulation has been shown to be safe and effective in women
Implementing P6 acustimulation has the potential to decrease the incidence of PONV experienced by women, the most vulnerable patient population

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