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CRNA's Knowledge and Attitudes Regarding Acupressure as an Adjunct to Postoperative Nausea and Vomiting Prevention

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Glossary

Abstract

Background: Postoperative nausea and vomiting (PONV) continues to be a problem for patients despite multimodal pharmacologic treatments available. Although acupressure has demonstrated clinical usefulness, it is still not widely used in mainstream anesthesia practice.
Objectives: The purpose of this descriptive survey design was to assess current knowledge and attitudes among CRNAs and SRNAs regarding acupressure for PONV treatment. Secondary objective was to develop an educational handout designed to increase the use of acupressure as an adjunct to postoperative nausea and vomiting prevention using the findings from this current study.
Methods: A descriptive, cross sectional survey design was utilized to assess the current knowledge and attitudes among CRNAs regarding the use of acupressure for PONV treatment.
Results: A total of 109 out of 1200 members of the Illinois Association of Nurse Anesthetists completed the survey (9% survey response rate). Overall, participants had adequate knowledge and positive attitudes regarding acupressure for PONV management. Out of the 14 knowledge and attitude questions on the survey, the items with lowest mean scores indicated deficits in the knowledge on effectiveness of acupressure for PONV treatment (M = 2.81; SD = .518), its impact on surgical outcomes (M =2.71; SD = .628), and the enhancement of comfort for patients postoperatively (M =2.87; SD =.511). Among sociodemographic variables examined, females scored higher in overall knowledge and attitudes for use of acupressure for PONV (p = 0.12).
Conclusions: Overall, CRNAs have adequate knowledge and positive attitudes regarding use of acupressure for PONV management, but lack knowledge on acupressure effects on patient comfort, efficacy of PONV relief and post-surgical outcomes. Areas of identified deficits were used to create an educational handout for CRNAs to further increase their knowledge and positive attitudes towards use of acupressure for PONV.
Relevance to Clinical Practice: The development of an educational handout, designed to increase the CRNAs' knowledge and positive attitudes regarding use of acupressure for PONV, can potentially lead to standardized implementation of acupressure in anesthesia practice, and a decreased incidence of PONV in surgical patients.

Introduction

Background and Significance of the Problem

Postoperative nausea and vomiting (PONV) is a self-limiting, but potentially serious symptom after anesthesia. PONV continues to be a problem for many patients after surgery despite new antiemetics, the routine use of prophylactic antiemetic drugs and available practice guidelines (White et al., 2012). Nausea and vomiting can be defined as defense mechanisms. Nausea is defined as "an unpleasant sensation vaguely referred to the epigastrium and abdomen" which normally precedes vomiting, which is a "forcible ejection of contents of the stomach through the mouth" (Medical Dictionary-Online, 2016). Nausea can be caused by numerous different stimuli, such as various drugs, medical interventions, surgery, pregnancy, and radiation (Holmer Pettersson & Wengstrom, 2012). Patients may express considerable distress and dissatisfaction with existing treatments for PONV. According to Holmer, Pettersson and Wengstrom (2012), "Many patients rate their nausea similar to or worse than pain" (p. 1799). Current treatment for PONV involves multimodal pharmacologic therapy while less invasive non-pharmacologic therapies, such as acupressure and acupuncture, are not being utilized. Acupressure as an adjunct to pharmacologic therapies that high-risk patients receive may prevent PONV and increase patient satisfaction with health care providers (White et al., 2012).

According to the National Center for Complementary and Alternative Medicine (NCCAM), Complementary and Alternative Medicine (CAM) is defined as a "group of diverse medical and healthcare systems, practices, and products that are not presently considered to be part of conventional medicine" (NCCAM, 2016). Both acupuncture and acupressure are a component of the CAM healthcare system (Faircloth, 2015). Although the exact origin of

acupuncture is unknown, it is believed that the Zhou dynasty in China (first century BC) was the first civilization to use stone needles to cure illness (Faircloth, 2015). Acupuncture is not unique to China and its use has been discovered amongst other Eastern cultures in addition to groups in Brazil, India, Japan and France (Faircloth, 2015). In 1971, James Reston introduced the concept of acupuncture to the United States after receiving acupuncture as treatment for postoperative pain after an appendectomy in China, and in 1996, the US Food and Drug Administration approved acupuncture needles as medical devices (Faircloth, 2015).

Cheong, Zhang, Huang, and Zhang (2013) state that "According to the theory of traditional Chinese medicine (TCM), surgery breaks the balanced state of the human body and disturbs the movement of both qi and blood, causes the stomach qi to reverse its direction and go upward, causing nausea and vomiting. Qi is known as the circulating life force whose properties are the basis for much of Chinese medicine" (Oxford Dictionary, 2016). One of the P6 pericardial meridian's (PC6) functions is to "avoid the adverse flow of qi, thus is an effective acupoint in preventing nausea and vomiting" (Cheong et al., 2013, p. 2). It is located 2 inches proximal to the distal wrist crease between the palmaris longus and flexor carpi radialis tendons (Hickman & Preston, 2005). Acupressure is a similar technique to acupuncture, except acupressure uses mechanical or physical pressure instead of needles over the same meridians of the body (Mamaril, Windle, & Burkard, 2006). Traditionally, CAM acupressure is based on a philosophy of balance and unity in the universe (Chernyak & Sessler, 2005). Scientifically, acupressure is thought to stimulate sensory nerves that travel to the brain, specifically the chemoreceptor trigger zone (CTZ), which innervates the nausea centers (Chernyak & Sessler, 2005). When the gastrointestinal tract's 5-HT chemoreceptors in the mucosa of the upper

digestive tract are stimulated by stress, narcotics, hormones, or intense emotions, a signal is sent to the CTZ and the vomiting reflex is elicited (Chernyak & Sessler, 2005). When acupressure is used to reduce nausea and vomiting, it is thought to reduce discomfort via endogenous beta-endorphins that are released in the spinal cord that modifies transmission of these signals to the CTZ (Chernyak & Sessler, 2005). To be effective, Chernyak and Sessler (2005) suggest that acupressure should be administered before the emetic stimulus.

Problem Statement

Strategies currently used in clinical practice to prevent and treat PONV vary. Conventional drug therapy has only proven partially effective in the treatment of PONV, especially vomiting, which can lead to serious problems such as incision pain, bleeding, dehydration, aspiration, and electrolyte disturbances (Mamaril et al., 2006). Many pharmacologic treatments also carry side effects such as sedation, headaches, and extrapyramidal symptoms (White et al., 2012). Multimodal drug therapy for PONV is the current treatment, however Gan and his colleagues (2007) suggest that the multimodal approach to treating PONV needs to extend beyond intra-operative treatment and begin with non-pharmacologic interventions such as acupressure in the pre-operative time. Although acupressure has demonstrated clinical usefulness and received governmental support, it has not yet transcended into mainstream US anesthesia practice (Faircloth, 2015). The basis for the proposed study was to determine current Certified Registered Nurse Anesthetists' (CRNA) knowledge and attitudes of acupressure toward treatment of PONV and create an educational handout based on the results.

Purpose of the Project

The purpose of this descriptive survey design was to assess current knowledge level and current attitudes among CRNAs regarding acupressure for PONV treatment and to develop an educational handout to increase the use of acupressure as an adjunct to postoperative nausea and vomiting prevention following the findings.

Clinical Questions

1. What is the current level of knowledge regarding the use of acupressure for PONV treatment among CRNAs?
2. What are the current attitudes regarding the use of acupressure for PONV treatment among CRNAs?

Based on the answers to the clinical questions, we designed an educational handout to provide to CRNAs.

Conceptual Framework

The conceptual framework used for this study was created using the Diffusion of Innovations Theory developed by Everett Rogers (1995). It was developed to show how the process of adapting new or different ideas is ultimately linked with improving the perioperative experience for patients. In the Diffusion of Innovations Theory, Rogers (1995) describes diffusion as the process by which an innovation is communicated through channels among members of a social system over time. It is a specialized form of communication focused on the spread of ideas that are perceived as new and represent a high degree of uncertainty to the individual. Rogers (1995) goes on to explain that the rate of adoption of a new idea depends on how the members of the relating social system perceive the idea. A portion of this theory describes the five steps of the adoption process: knowledge, persuasion, decision,

implementation, and confirmation (see Figure 1). Knowledge occurs when an individual (or other decision-making unit) first becomes aware of a new innovation and learns its basic functions. Persuasion occurs when the individual forms a positive or negative attitude towards the innovation. Decision occurs when the individual participates in activities that lead to adoption or rejection of the innovation. Implementation occurs when the individual puts the innovation into practice. Finally, confirmation occurs when the individual seeks reinforcement for the decision to put the innovation to use. If the individual is exposed to conflicting messages about the decision, they may reverse that decision (Rogers, 1995).

Although the concept of pressure-point stimulation has been around for thousands of years and is supported by research, it is not yet part of mainstream healthcare practice. This conceptual framework explains how surveying CRNA's knowledge and attitudes about P6 point acupressure for PONV treatment fits into the process of diffusion for this innovation. Our project placed an emphasis on the knowledge portion of this theory. Once the CRNA's knowledge was assessed, an educational tool was created to enhance this knowledge. From there, the CRNA will have the opportunity to be *persuaded* positively or negatively towards the innovation and then *decide* if this modality is worth *implementing* into practice. As mentioned earlier, preventing PONV has many potential benefits for patients. Assessing and then improving knowledge through education of CRNAs is the first step in improving patients' perioperative experiences.

Literature Review

This section reviews current literature focusing on a range of aspects of P6 meridian acupressure in regards to the prevention and treatment of PONV. This section also addresses

CRNA's knowledge and attitudes regarding acupressure as an adjunct to PONV prevention. Databases that were used to search for articles include: CINAHL, EBSCOhost, MEDLINE, and PubMed. Terms used to search include: *postoperative nausea and vomiting, PONV, acupressure, adjunct, alternative treatment, anesthesia, complementary alternative medicine, CAM, CRNA, knowledge, attitude, multi-modal, perioperative, P6, prevention*, and *treatment*.

Overview of P6 Meridian

Although some studies have produced inconclusive results with P6 point acupressure for prevention of PONV, a systematic review from the Cochrane Library including 59 trials and 7667 participants, Lee, Chan, and Fan (2015) concluded that the effect of P6 acupoint stimulation is comparable to antiemetics in the prevention of PONV. Research methods of various studies differ. Some researchers compared acupressure band application to traditional pharmacologic modalities while others compared acupressure band application to "sham" band application. White et al. (2012) conducted a study on 100 patients undergoing laparoscopic surgery. The anesthetic was standardized and all patients were given ondansetron 4mg IV and dexamethasone 4mg IV intraoperatively. Half of the patients were given a "sham" acupressure device while the other half received an acupressure wristband prior to anesthesia induction. Results showed that vomiting from 0-72 hours postoperatively decreased from 30% to 12% in the acupressure group ($P = 0.03$, 95% confidence interval 2%-33%). There was not a statistically significant decrease in nausea, but the authors suggest that this may have been due to insensitive assessment methods (White et al., 2012). Direkvand-Moghadam and Khosravi (2013) found acupressure and metoclopramide to have comparable effects on PONV. In 102 patients undergoing elective cesarean section under spinal anesthesia, the incidence of vomiting

decreased from 32.34% (11/34) in the control group to 17.64% (6/34) in the acupressure group and to 11.6% (4/34) metoclopramide group. Soltani and colleagues (2010) compared the use of ondansetron, metoclopramide and acupressure for PONV prevention in patients undergoing strabismus surgery. The authors concluded that the incidence and severity among the groups were not significantly different and all had significant reductions from the placebo group. Overall, the literature shows P6 acupressure stimulation to have comparable results in reduction of PONV to traditional pharmacologic interventions across many patient and surgical populations.

Variability in Acupressure Application

Throughout the literature various types of pressure bands were applied to the P6 meridian for prevention of PONV. In the study by Adib-Hajbaghery and colleagues (2013), acupressure was applied using a Psi Band. The wristbands contained a special button that was applied to the P6 point on each wrist. Gauges on the bands were applied so that the button pressed the P6 point 4mm in depth (Adib-Hajbaghery et al., 2013). Another type of pressure band used was the Pressure Right Strip® utilized by White et al. (2012). In the study conducted by Direkvand-Moghadam and Khosravi (2013) bilateral acupressure bands were placed not to a specific depth on the P6 point but so that a piece of paper was not able to fit between the band and skin. Other research conducted by Soltani et al. (2010) also used a piece of paper placed between the band and the skin as a way to determine if the band was too loose, although the targeted depth was one centimeter deep. The study conducted by Karlsson et al. (2015) looked at PONV after craniotomy used unilateral P6 point stimulation instead of bilateral. Results did not show that acupressure combined with ondansetron significantly reduced PONV in this patient population.

Although various bands were utilized throughout the literature, all were placed on the wrist with the goal of applying pressure to the P6 meridian in a manner which applied adequate pressure but remained safe for the patient.

Timing and Duration of Acupressure

Timing of acupressure band placement varied among the reviewed studies. Some researchers placed the bands preoperatively and some placed the bands post-operatively. In the study by Adib-Hajbaghery et al. (2013), Acubands were placed after the patient regained consciousness and bands were then left in place for seven hours. Acupressure to the P6 meridian was shown to decrease the incidence of vomiting but not nausea (Adib-Hajbaghery et al., 2013). Direkvand-Moghadam and Khosravi's (2013) study differed in that the acupressure bands were placed fifteen minutes prior to induction of anesthesia and left on for six hours. Soltani et al. (2010) had a similar research design in that the acupressure bands were placed thirty minutes prior to anesthesia induction and were left in place for six hours. White et al. (2012) also applied the acupressure bands prior to anesthesia induction (30-60min prior) but they left the bands in place for 72 hours after surgery. Both Adib-Hajbaghery and colleagues as well as White et al. (2012) found a reduction in vomiting postoperatively but no significant reduction in nausea despite differences in timing and duration of acupressure band placement. Other studies reviewed found P6 acupressure application to be comparable to traditional pharmacologic treatments

Patient Population of Interest

Lee and his colleagues (2008) conducted a study with patient populations in regards to the effectiveness of acupressure at the P6 pressure point for treatment of PONV including high risk patients such as younger females who have a prior history of motion sickness, morning

sickness during pregnancy, nausea with stress, and/or receiving chemotherapy agents. This study reported that the patients that were in the acupressure band intervention group who had previously reported severe nausea following their chemotherapy treatment was drastically lower and they also had significantly less severe nausea that did the group without the acupressure band (Lee et al., 2008).

Cheong et al. (2013) explain that PONV occurrence rates may be attributed to the type of surgery, site of surgery, and the type of anesthesia. "Breast and gynecological surgeries presented the most frequent report of PONV in adults" (Holmer Pettersson, & Wengstrom, 2012, p. 1801). In the child population, operations that have been associated with a high incidence of vomiting in children include orchidopexy and penile surgery, adenotonsillectomy, strabismus, and hernia repairs (Chatterjee et al., 2011). Research has indicated that general anesthesia in contrast to sedation or local anesthesia results in higher occurrence rates of PONV (Cheong et al., 2013).

CRNA's Knowledge and Attitudes Regarding P6 Meridian

While Brolinson, Price, Ditmyer, and Reis (2001) assessed registered nurse's perceptions of CAM therapies including acupressure, using the search terms addressed above, there does not appear to be any current data on CRNA knowledge and attitudes regarding P6 meridian as an adjunct to management of PONV. This lack of data demonstrated a need for our research on CRNA's knowledge and attitudes on this topic. We used the results of our survey to create an educational module to enhance CRNA knowledge. Al Mansour and colleagues (2015) assessed medical students' knowledge, attitudes and practice (KAP) of CAM by providing the students a 48-hour CAM course and administering pre- and post-tests before and after the course. The researchers found that this educational model tended to have a positive impact on the KAP of the

medical students (Al Mansour et al., 2015). A follow-up to our project could involve a pre- and post- educational handout survey to see if education altered CRNA knowledge and attitudes towards implementing P6 meridian acupressure for PONV treatment.

To summarize, reviewed literature using acupressure for treatment of PONV focuses mainly on the P6 acupressure point by applying bands to one or both wrists. Timing of band placement was most often found to be within one hour of anesthesia induction, but some studies placed the band post-operatively. Duration of band placement ranged from six to seventy-two hours, but was most often left in place for between six and seven hours. Populations at high-risk for PONV would benefit from including acupressure as an adjunct to PONV treatment. High risk populations include: young females having breast and gynecologic surgeries or receiving chemotherapy; or children having one of the emetogenic procedures listed above under general anesthesia. Cost of manual acupressure is free while Lee et al. (2008), proclaim that the average cost of each acupressure band is $10.

Of the articles obtained from the literature review, four studies concluded that acupressure application resulted in significant decreases in PONV; three studies resulted in comparable effects to metoclopramide, ondansetron or both; two studies resulted in decreased vomiting but not nausea; and two studies found no significant decrease in PONV (see Table 1).

Evidence for Efficacy of Acupressure

Evidence from the literature review supports the use of P6 meridian acupressure stimulation for prevention of PONV. Despite the variety of antiemetics available, PONV remains a problem for surgical patients (Nunley et al., 2008). Acupressure has a place in multimodal therapy for patients suffering from PONV especially due to its low cost compared to pharmacologic therapies and low incidence of side effects (Nunley et al., 2008). CRNAs assess

patients preoperatively for risk factors associated with PONV and create the anesthetic plan including PONV prevention and treatment. Because there is a lack of research regarding CRNAs knowledge and attitudes concerning acupressure for PONV further research into this topic was warranted.

Methods

Design

A descriptive survey design was used to assess the current knowledge and attitudes among CRNAs regarding the use of acupressure for PONV treatment. Survey results provided data to assist in our attempt to improve the quality of patients' perioperative experience with the use of acupressure.

Sample

This study used convenience sampling as a method to recruit subjects. Although this method is not as rigorous as probability sampling, it was chosen because of time and resource limitations. Participants were recruited to meet the following inclusion criteria: 1) able to read English, 2) members of Illinois Association of Nurse Anesthetists (IANA, and 3) anesthesia providers licensed to deliver anesthesia care in Illinois, either independently, under direct supervision of an anesthesiologist, or as a SRNA. Exclusion criteria included those who are not able to read English, non-members of IANA, and are not anesthesia providers licensed to deliver anesthesia care in Illinois in any setting. Subjects who met the eligibility criteria of this study were recruited until the desired sample size of 100 participants was filled. The IANA has approximately 1,200 members, so the expected response rate for the online survey was 5-10%.

Subject Collection Procedure

Following approval from DePaul University's institutional review board (IRB)

(Appendix E), a survey was sent out to IANA members via email. CRNAs and Student Registered Nurse Anesthetists (SRNAs) were recruited as the target sample. IANA members received an enrollment email and an attached letter which informed potential participants of the voluntary and anonymous characteristics of the study.

Setting

Data was obtained online from members of IANA via an email with the informative letter attached (Appendix A). Participants voluntarily opened the informative letter and proceeded on to the survey. A blind sampling of IANA members was accomplished via the email distribution. In addition to the informative letter, a copy of DePaul University's IRB approval form was attached to the email (Appendix B). Participants were emailed via an IANA administrator, thus primary investigators were blinded to potential study participants.

Instruments

The multiple-choice online survey designed for this study included two sections: (1) demographic questionnaire (six items); (2) current knowledge and attitudes regarding acupressure as an adjunct for treatment of PONV (15 items) (Appendix C). The Questionnaire on herbal supplement knowledge and beliefs developed by Temple, Fagerlund, & Saewyc (2005) was modified for this project. This modified online survey was used to measure knowledge and attitudes regarding the use of acupressure for treatment of PONV. We added two questions to assess participant's perception of how effective acupressure is as an adjunct to PONV treatment. A Likert scale was utilized to record participant responses.

Temple and colleague's questionnaire was developed in consultation with two doctorally prepared nurse faculty, a CRNA educator, and a nurse researcher (Temple et al., 2005). It was created due to the lack of existing appropriate instruments to assess health care providers'

knowledge and beliefs of herbal supplements. The survey was evaluated for content validity, readability, and internal consistency. Frequencies and percentages were calculated for survey responses. The questions regarding the anesthetists' personal beliefs about herbal supplements were reverse scored for negatively stated questions and combined. A correlation matrix and a Cronbach's α were used to analyze the internal consistency (Cronbach's α, .82) and scale reliability (single scale) (Temple, Fagerlund, & Saewyc, 2005). The adapted scale in this present study had adequate reliability with a Cronbach's alpha reliability coefficient = .69. To compare mean knowledge scores by gender, geographic location, and between users and nonusers, *t* tests for independent samples were performed. Pearson product-moment correlations were performed to examine associations between knowledge scores and age or years practicing as a CRNA.

We included five demographic questions, pertinent to our survey. The questions included: years practicing as a CRNA, highest level of education completed, gender, ethnic origin, age, and work practice setting.

Ethical Considerations

Prior to data collection, the institutional review board from DePaul University reviewed the survey. There were no psychological or physical risks associated with this research and participants were informed that a stipend for participation will not be provided. The participants received information regarding the purposes of the project: 1.) assess current knowledge level among CRNAs regarding acupressure for PONV treatment, and 2.) assess current attitudes among CRNAs regarding acupressure for PONV treatment. Participants were informed that this survey was voluntary and anonymous in the informational letter. To ensure anonymity, the IANA was asked not to provide any participant identifying factors to Kimberly Homa or Jacqueline Kuhn. Information was provided that participant confidentiality would be maintained

and that they could withdraw from the survey at anytime without penalty. Participants were informed that review of the information letter and continuation to the survey served as their voluntary agreement to participate. Only our research team had access to the data obtained from the anonymous survey. The survey sent out through the IANA was anonymous and confidential. There were no physical or psychological risks associated with this research and the institutional review board at DePaul University reviewed and granted permission to employ our survey to IANA members.

Data Collection Procedure

After obtaining IRB approval from DePaul University, participants were enlisted via email from the IANA contact list, which the primary investigators do not have access to. The survey was distributed to all active IANA members through a depaul.qualtrics.com link. Participants were assured of confidentiality, that all information was reported as aggregate data. Participants were informed that completion of the survey was voluntary and anonymous.

Data Analysis

Data was downloaded from Qualtrics to SPSS version 23 (International Business Machines, 2017). Descriptive statistics were utilized to describe the sociodemographic characteristics of study participants. Detailed description of means and standard deviations for each item in the knowledge and attitudes questionnaire were also generated using descriptive statistics. Non-parametric Kruskal-Wallis test by ranks and Kruskal-Wallis H test were used to examine statistically significant differences in the mean scores on PONV knowledge and attitudes between dichotomous groups with different sample sizes (men versus women; partnered vs. non-partnered) and among three groups or more, respectively. Parametric statistics were not appropriate to use in this study given that the mean scores for knowledge and attitudes were not

normality distributed with skewness statistics value of -2.15. According to Doane and Seward (2011), a study with a sample size of 100 should have skewness statistics values between +0.391 and -0.391 in order to meet the assumption of normality of data distribution prior to running parametric statistics.

Results

Description of Sample

Of the approximately 1,200 members of the IANA, 109 participants responded to the survey (9% survey response rate). Most participants have been a practicing CRNA for zero to ten years (n = 57, 52.3%). A majority of participants had a Master or Doctoral degree (n = 81, 74.3%). Sixty-eight percent of participants were female (n = 74). Most participants identified their ethnic origin as White (n = 95, 87.2%). In regards to age, 60% of participants were under 50 years old (n = 65). Most IANA participants reported that they practiced in a setting that included anesthesiologists and/or SRNAs (n = 99, 90.8%). All sociodemographic characteristics of study participants are summarized in Table 2.

Knowledge and Attitudes on Acupressure for PONV Treatment

Overall, knowledge and attitudes of the participants were positive. Table 3 shows the minimum, maximum, mean scores and standard deviation for each item in the knowledge and attitudes questionnaire. Mean scores are listed in descending order. For knowledge and attitude questions, participants were asked to rate their answers on a 4-point Likert-type scale. Higher scores mean higher level of knowledge and positive attitudes. The participants selected from the following answer options: *(1) Strongly disagree, (2) Disagree, (3) Agree, (4) Strongly agree*. The last five items listed statements about personal use and recommendation of acupressure use for PONV. The Likert-type scale for these responses went as follows: *(1) Regularly, (2)*

Occasionally, (3) Rarely, (4) Never. Items worded negatively were reverse coded. The item with the highest mean score (M = 3.91; SD = .442) was "I discourage acupressure for treatment of PONV to my family and friends." The item with the lowest mean score (M = 2.71; SD = .628) was "Acupressure use does not have an impact on surgical outcomes."

Sociodemographic Variables Effect on Knowledge and Attitude

The mean scores on knowledge and attitude between dichotomous grouping variables were analyzed using independent samples Kruskal-Wallis test. Participants' years practicing as a CRNA were divided into two groups, those practicing from zero (SRNA) to ten years and those practicing 11 years and greater. Results showed that no statistically significant difference in knowledge and attitudes existed between the two groups (Table 4). Independent samples Kruskal-Wallis test was also used to compare the mean scores on knowledge and attitude scores between males and females. There was a statistically significant difference in scores between the two groups (t = *-3.659; p* =. 012), with female having higher mean scores than male (see Figure 3).

The participants were divided into two age groups, those 20-49 years old and those 50-69 years old. The practice setting of the participants was divided into CRNA only and CRNA with anesthesiologist; and CRNA, students of anesthesia, and anesthesiologist. Independent samples Kruskal Wallis test showed no statistically significant differences in mean scores according to age and practice setting groupings (see Table 4). The participants' ethnicity was homogenously White, which made the comparison of mean scores for this variable not possible.

The Kruskal-Wallis H test was performed to compare the mean scores on PONV knowledge and attitude among three groups by education. Participants' educational level was

divided into three groups: (1) nursing diploma, associate degree in nursing, and bachelor's degree in nursing (2) master's degree in nursing and (3) doctorate degree. The Kruskal-Wallis H test revealed no statistically significant difference in the mean scores on knowledge and attitudes regarding acupressure between and within groups according to three levels of education (X^2 = 1.62; p = *.445*).

Discussion

Traditionally, CAM acupressure is based on a philosophy of balance and unity in the universe (Chernyak & Sessler, 2005). Scientifically, acupressure is thought to stimulate sensory nerves that travel to the brain, specifically the chemoreceptor trigger zone (CTZ), which innervates the nausea centers (Chernyak & Sessler, 2005). This study assessed knowledge and attitudes of CRNAs toward the use of acupressure as an adjunct to the management of PONV. The respondents to our survey were Illinois CRNAs and SRNAs who were also IANA members. The knowledge and attitude scores across all items were found to be positive with an average mean score of 3.22 out of 4. There were no other studies on this topic found in the literature to which to compare our results.

The results of our survey indicated that women have a higher knowledge level and positive attitude toward acupressure use for PONV when compared to men (mean score of 45.82 vs. 43.21). Gender was the only sociodemographic variable of statistical significance. Since this data did not have a normal distribution, we did not focus our education on the education of acupressure for male CRNAs.

Items on the survey with the lowest mean scores for knowledge and attitudes toward acupressure for PONV indicated deficits regarding the enhancement of comfort for patients postoperatively and that acupressure is an effective treatment for PONV. Results also indicated

a lower mean score on knowledge and attitudes toward acupressure use having an impact on surgical outcomes (Figure 2).

An educational handout was created and incorporated the knowledge and attitude deficits noted above. The development of this handout fell into the knowledge phase of our conceptual framework based on the diffusion of innovations theory. Future phases of the conceptual framework include: persuasion, decision, implementation and confirmation. These phases will occur sequentially once the handout is distributed to CRNAs. Positive responses from CRNAs could ultimately lead to use of acupressure and improved patient experience including increased comfort. Without nausea and vomiting there is also the potential to improve surgical outcomes. The conceptual framework provided a foundation for the handout while keeping the end goal in focus.

Limitations

One limitation of our study is that it only surveyed participants from Illinois; therefore, our results may not apply to other geographic locations. Also, we did not survey other anesthesia providers such as anesthesiologists or anesthesiologist assistants. A major limitation of our study was that 87.2% of respondents identified their ethnic origin as white, so we were not able to assess the effect of ethnicity on knowledge and attitudes. However, we found gender as a significant factor in the overall mean score for knowledge and attitudes on acupressure for PONV. Our initial data analysis showed inadequate reliability when all items in the survey tool were included. We had to eliminate question number seven to maintain the adequacy of survey's reliability. The item removed pertains to confidence of knowledge base for acupressure in IANA members.

Future Direction for Research

Future study includes distributing the educational handout to IANA members and assessing its effectiveness for increasing knowledge and attitudes of CRNAs towards use of acupressure for PONV, based on the deficits identified. Additionally, future investigators could distribute the survey nationally, or examine the feasibility of implementing acupressure as a treatment option for patients with risk factors for PONV.

Implication for Practice

The results of our survey showed that as a whole, SRNAs and CRNAs in Illinois have positive knowledge and attitudes regarding this practice. Out of the 14 knowledge and attitude questions on our survey, the lowest mean scores were found to regard lack of knowledge on the topic. Distribution of our educational handout has the potential to increase awareness on the topic as well as increase knowledge and improve attitudes in the lowest scoring areas identified in our survey. Our data shows that CRNAs have the willingness to implement acupressure into their practice and is the first step of bringing this therapy into mainstream practice.

Conclusion

This study found that all study participants including IANA CRNAs and SRNAs have an overall adequate knowledge and positive attitudes on acupressure for PONV management. However, they need more information on the effects of acupressure in terms of patient comfort, efficacy, and impact post-surgery. We identified that further education should focus on the effectiveness of acupressure, and its potential to improve patient comfort and surgical outcomes. Distribution of our educational handout has the potential to increase knowledge and attitudes in the deficit areas identified in this present study and is the first step in bringing this therapy into anesthesia practice. Additionally, this study provides preliminary evidence for female gender as a factor for a higher overall knowledge and attitudes on acupressure among CRNAs and SRNAs.

Table 1. Evidence Based Synthesis Table

Citation	Study Objectives	Level / Design / Participants / Statistics Used	Human Subject Issues	Intervention / Outcome Measurement Tools / Questions Concerning Interventions	Findings / Conclusions/ Implications / Adverse Effects of Intervention	Study Limitations
Adib-Hajbaghery, M., Etri, M. Hosseainian, M., & Mousavi, M. (2013)	To investigate the effects of pressure to the P6 point on pain, nausea and vomiting after appendectomy	-Single-blind, randomized controlled clinical trial on 88 patients after appendectomy -Subjects randomly assigned to 2 groups -Student's t-test and chi-square test	None	-Intervention group: pressure was applied to P6 acupoint using Acubands after regaining consciousness -Control group: Acubands w/o push botton were placed, but loosely on patients' wrists. -The severity of pain and occurrence & severity of n/v were recorded in both groups every hour for 7hrs using a form with a visual analogue scale (VAS) to record the values	-12 patients in the acupressure group and 18 in the control group had vomiting ($p = 0.01$) -Conclusion: Pressure to P6 did not significantly reduce pain or nausea but the incidence of vomiting was decreased -Radial pulses were carefully examined to ensure acubands did not impair blood flow -If pt reported discomfort with band, researcher would loosen band for 10min and tighten again every 2hrs	Small study sample
Agarwal, A., Bose, N., Gaur, A., Singh, U., Gupta, M. K., & Singh, D. (2002)	To compare the effectiveness of acupressure wrist bands with ondansetron in the prevention of postoperative nausea and vomiting (PONV) in patients undergoing laparoscopic cholecystectomy	-Randomized, prospective, double-blind and placebo-controlled study -150 patients aged 18-60yrs, ASA I or II, undergoing laparoscopic cholecystectomy	None	-Patients were divided into groups of 50 each: group 1(control), group 2(ondansetron), and group 3(acupressure) -Outcome measures: incidence of PONV was evaluated within 6hr of patient's arrival in PACU and then at 24hrs. Nausea	-The incidence of PONV in the control group was 44%, acupressure was 10% and ondansetron was 8% in the first 6hrs post-op. -Between 6 and 24hrs there was no significant difference in PONV among the 3 groups -Acupressure was similar to administration of	-Results limited to specific sample population -Small sample size

				was graded on a scale of 1-10, and vomiting/retching were classified according to number of episodes in 24hrs.	zofran 4mg IV in reducing PONV.	
Alkaissi, A., Evertsson, K., Johnsson, V., Ofenbartl, L., & Kalman, S. (2002)	To investigate the effect of sensory stimulation of the P6 point of PONV after gynecological surgery in the everyday clinical setting	-Prospective, consecutive, randomized, multicentre, placebo-controlled, double-blind clinical trial with a reference group -410 women undergoing general anesthesia for elective gynecological surgery	None	-Seabands were placed on patients at the P6 acupressure point or on a non-acupoint just before the start of anesthesia -Patients were asked to wear the bands for 24hrs -Participants were asked to record their level of nausea, vomiting and pain at different time points- nausea was recorded on a scale of 0-6. -Probability of postoperative vomiting was predicted using the Apfel risk score	-The incidence of PONV was 46% in the reference group, 38% after pressure on a non-acupoint and 33% after P6 acupressure. The decrease from 46% to 33% is statistically significant -There was a significant decrease following vaginal surgery (44%) but not after laparoscopic surgery (7%)	-Results limited to specific sample population
Direkvand-Moghadam, A. & Khosravi, A. (2013)	To compare the effects of acupressure and metoclopramide on PONV in patients undergoing c-section with spinal anesthesia	-Randomized clinical trial -102 pregnant women, physical status I and II, elective c-sections, ages 18-35yrs, gestational age 38-40 weeks	None	-Patients randomly assigned to 3 groups -Control group: no intervention -2nd group: 10mg metoclopramine IV immediately prior to induction -3rd group: acupressure	Findings: Incidence on n/v was lower in the metoclopramide and acupressure groups compared to the control group -No side effects or complications were caused by any intervention -Conclusion: The use of	-Results limited to specific sample population

				bands applied to P6 points on both wrists 15min before induction -Outcome measures: nausea was evaluated on a linear numeric scale from 0 (none) to 10 (severe)	metoclopramide and acupressure was found to be equally effective for reducing emetic symptoms (nausea, retching, vomiting)	
Faircloth, A. (2015)	(AANA Journal Course) Review of acupuncture and acupressure's history & presents evidence-based support of the role of these modalities in anesthesia practice.	N/A	N/A	N/A	-Acupuncture and acupressure have demonstrated clinical usefulness & received governmental support, but have not yet transitioned into mainstream anesthesia practice in the US -These modalities may provide a cost-effective complement to drug shortages -More research, especially in the United states, is warranted	N/A
Hickman, A. G., Bell, D. M., & Preston, J. C. (2005)	(AANA Journal Course) What is known and unknown in the literature regarding the use of acupressure as a non-pharmacologic al alternative to commonly utilized antiemetic prophylaxis	-N/A	-N/A	-N/A	-Because the Western culture almost exclusively favors evidence-based scientific practice and interventions, the search continues for an ideal, cost-effective, safe, and efficacious pharmacological agent to prevent PONV. -Eastern culture, on the other hand, relies heavily on naturopathic remedies	-N/A

					whose successful use has spanned thousands of years. -Increasing attention has been given to the potential benefits of nonpharmacologic al intervention for the prevention of PONV in association with anesthesia care.	
Karlsson, A., Lindgren, L., Bergenheim, T., & Koskinen, L. O., (2015)	-The primary aim of this study was to determine whether P6 acupressure with Sea-Band could reduce postoperative nausea after elective craniotomy. -Secondary aims were to investigate whether the frequency of vomiting and the need for antiemetics could be reduced.	- In this randomized, double-blinded, placebo-controlled study, patients were randomized into either a P6 acupressure group (n=43) or a sham group (n=52).	-All patients were having an elective craniotomy - this is known to be a procedure w/ a high risk for PONV symptoms.	-Bands were applied unilaterally at the end of surgery, and all patients were administered prophylactic ondansetron. Postoperative nausea was evaluated with a Numerical Rating Scale, 0 to10, and the frequency of vomiting was recorded for 48 hours.	-Unilateral P6 acupressure with Sea-Band applied at the end of surgery together with prophylactic ondansetron did not significantly reduce PONV or the need for rescue antiemetics in patients undergoing craniotomy. Our study confirmed that PONV is a common issue after craniotomy, especially after infratentorial surgery.	-Patients were administere d prophylactic odansetron which may have not helped researchers figure out if the Sea-Band works to prevent PONV.
Majholm, B., & Moller, A. M., (2011)	-Stimulation of acupoint P6 is described as an alternative method for prophylaxis of postoperative nausea and vomiting. They aimed to investigate the effect of P6 acupoint stimulation on the incidence of	-Randomised, double-blinded study -134 healthy, non-smoking women scheduled for breast surgery were randomised either to P6 stimulation or to sham control. -Wristbands were applied	None	-Primary outcomes were postoperative nausea and/or vomiting.	-112 participants completed the study. -There were no statistically significant differences in the incidence of nausea [P6 stimulation versus sham control, or vomiting [P6 stimulation versus sham control. -Approximately, ⅓ of the patients reported side	-They did not find the Vital-Band effective in preventing either nausea or vomiting after operation in women undergoing breast surgery.

	postoperative nausea and vomiting within 24 h postoperatively with an acupressure wristband: Vital-Band.	and covered with a dressing before induction of anesthesia. -Follow-up was carried out three times within 24 h postoperatively			effects caused by the wristband, for example, redness, swelling and tenderness.	
Mamaril, M. E., Windle, P. E., & Burkard, J. F. (2006)	-Not a research article, just a nice overview of complementary treatments for the management of PONV.	-N/A	-N/A	-Acupressure and acupuncture were interventions and patient satisfaction and lack of PONV symptoms were outcomes.	-Article describes how the PC6 meridian works and that acupressure is appropriately used to prophylactically prevent PONV.	-N/A
Ming, J., Kuo, B. I., Lin, J.& Lin, L. (2002)	To examine the effect of stimulating two acupressure points (P6 and H7) on the prevention of postoperative nausea and vomiting	-Randomized block manner -150 patients receiving functional endoscopic sinus surgery (FESS) under GA, ASA Class I or II	None	-Subjects were randomly assigned to a finger-pressing group (treated w/therapy for 20min 3x; 1hr before surgery, after arriving in recovery room, & 10hrs post op), wrist-band group, or control group -Outcome measures: Index of nausea, vomiting and retching & the state of anxiety inventory	-Significant decreases in incidence of postoperative nausea and vomiting between the acupressure, wrist-band, and control groups. -Decrease of nausea from 73% to 43.2% -Decrease of vomiting from 90.5% to 42.9%	-Results are limited to this specific population -Between the 2nd and 24th hour post-op it was likely that some participants neglected to record an occurrence of nausea & vomiting, resulting in a lower reported incidence -The study was not double-blind because the data collectors could see if the patient was wearing a band
Noroozinia, H.,	Investigate the	-Double blind	None	-Subjects	Acupressure	-Results

Mahoori, A., Hasani, E., Gerami-Fahim, M. & Sepehrvand, N. (2013)	effect of pre-surgery use of acupressure on the occurrence and the intensity of nausea and vomiting during and after c-section under spinal anesthesia	randomized control trial -152 ASA class I or II pregnant women who were candidates for elective c/s under spinal anesthesia		randomly allocated to 2 groups -A single size elastication band placed on all patients at P6 pressure point, but only the intervention group contained a button on the internal surface to provide pressure -Placed 30 min prior to spinal -PONV assessed during surgery, in recovery, and at hrs 1, 2, and 3hrs post-op. -Outcome measures: Visual analogue scale (VAS)- rate nausea from 1-100.	reduced incidence of nausea and vomiting in patients undergoing cesarean delivery from 35.5% to 13.2% (P < .001)	limited to this specific population
Soltani, A. E., Mohammadinasab, H., Goudarzi, M., Arbabi, S., Mohtaram, R., Afkham, K., Momenzadeh, S., Darabi, M. E. (2010)	To compare the efficacy of acupressure with treatment induced by ondansetron and metoclopramide on reduction of PONV after strabismus surgery.	-Randomized, prospective, double-blind, placebo-controlled trial -200 patients ASA I and II, age 10-60 y/o, who underwent strabismus surgery	None	-Group 1-control group -Group 2-received metoclopramide 0.2mg/kg -Group 3-received ondansetron 0.15mg/kg IV prior to induction -Group 4-acupressure wrist bands applied to P6 points, applied 30min prior to induction and removed 6hrs post op -Outcome measures: PONV evaluated within 0-2 hrs and 2-24 hrs	-Incidence and severity of PONV was not significantly different among acupressure, metoclopramide and ondansetron groups during 24 hrs.	-Results limited to this specific population

				after surgery by blinded observer		
Turgut, S., Ozalp, G., Dikmen, S., Savli, S., & Tuncel, G., (2007)	To evaluate the effectiveness of acupressure in preventing nausea and vomiting in patients undergoing gynaecological operations and receiving a patient-controlled analgesia device.	-Single-blind, randomized controlled trial of 100 gynecological patients placed into one equal groups of 50 with acupressure correctly applied and one group where acupressure was incorrectly applied. Ages 40-65 yo.	None	-Patients were randomized into one of two groups, acupressure and control. In the acupressure group, acupressure bands were placed on both wrists with the plastic bead positioned at the P6 point. In controls, beads were placed at a non-acupoint site. All patients received a standard general anaesthetic.	-Pain and sedation scores, respiratory rate, heart rate, arterial pressure and oxygen saturation were recorded for 24 h. Metoclopramide 10 mg was administered intravenously as a rescue antiemetic. -In the acupressure group, 33% of patients had nausea compared with 63% controls. The cumulative incidence of vomiting at 24 h was 25% with acupressure and 61% in controls. The incidence of nausea, vomiting and antiemetic use was significantly lower with acupressure. -*Acupressure at the P6 meridian point is an effective alternative for the prevention of nausea and vomiting in patients receiving patient-controlled analgesia with morphine after gynaecological surgery.	-Exclusion criteria were obesity, diabetes mellitus, and history of motion sickness, postoperative nausea and vomiting, or smoking.
White, P. F., Zhao, M., Tang, J., Wender, R. H., Yumul, R., Sloninsky, A. V., … Cunneen, S. (2012)	Primary: To assess the efficacy of a disposable acupressure device on the incidence of emetic	-Prospective, randomized, double-blind study -100 ASA I and II outpatients scheduled to	None	-In preoperative holding area, 30-60 min before entering OR, a pressure right strip or "sham" strip was applied to P6 pressure	-Incidence of vomiting at 24hrs significantly decreased in the acupressure group (10% vs 26%, P=0.04) -Overall incidence	-Failure to demonstrate a statistically significant effect on postoperative nausea

	episodes and quality of recovery when used in combination with ondansetron and dexamethasone for antiemetic prophylaxis. -Secondary: assess the effect of this multimodal therapy on the incidence of emetic symptoms from 24-72 hrs, the need for rescue antiemetics, patient satisfaction, quality of recovery, and times to resume normal activities.	undergo major laparoscopic surgical procedures		point. -Pts were instructed to leave in place for 72 hrs after surgery -Outcome measures: Incidence of nausea and vomiting and need for 'rescue' antiemetic therapy were assessed at specific times for 72 hrs post-op. -Recovery profiles and quality of recovery questionnaires were evaluated at 48 and 72 hrs post-op -Patient satisfaction w/PONV management was assessed at end of 72hr study	of vomiting from 0-72 hrs after surgery decreased from 30% to 12% in acupressure group -Adjunctive use of acupressure seemed to enhance patient satisfaction w/PONV management at 48hrs post-op	may have been related to an insensitive assessment method (binary yes/no response rather than conventional 100-mm visual analog scale or 4-point scale for example)

Abbreviations Legend:

CAM: Complementary and Alternative Medicine
CRNA: Certified Registered Nurse Anesthetist
CTZ: Chemoreceptor Trigger Zone
IANAL: Illinois Association of Nurse Anesthetists
IRB: international review board
IV: Intravenous
Mg: Milligram
NCCAM: National Center for Complementary and Alternative Medicine
P6: Pericardium 6
PC6: Pericardium 6
PACU: Post Anesthesia Care Unit
PONV: Post Operative Nausea and Vomiting
SRNA: Student Registered Nurse Anesthetist
TCM: Traditional Chinese Medicine

Table 2. Study Participants Sociodemographics Features (N=109)

Variables	Description		Frequency (n)	Percent (%)
Years practicing	0 years		21	19.3
	1-3 years		15	13.8
	4-6 years		8	7.3
	7-10 years		13	11.9
	11-15 years		14	12.8
	16-20 years		4	3.7
	> 20 years		34	31.2
		Total	109	100
Education level	Diploma		6	5.5
	Associate		0	0
	Bachelor		22	20.2
	Master		56	51.4
	Doctorate		25	22.9
		Total	109	100
Gender	Male		35	32.1
	Female		74	67.9
		Total	109	100
Ethnicity	White		95	87.2
	Black or African American		2	1.8
	Asian		6	5.5
	Hispanics		5	4.6
	American Indian		1	0.9
		Total	109	100
Age	20-29		11	10.1
	30-39		32	29.3
	40-49		22	20.2
	50-59		27	24.8
	60-69		17	15.6
	70+		0	0
		Total	109	100
Practice setting	CRNA only		10	9.2
	CRNA and Anesthesiologists		50	45.9
	CRNAs, SRNAs, and Anesthesiologists		49	44.9
		Total	109	100

Table 3. Descriptive Statistics for Knowledge and Attitudes Acupressure Use for PONV Scale* (N=109)

Scale Items	Minimum	Maximum	Mean	Standard Deviation
I discourage acupressure for treatment of PONV to my family and friends	1	4	**3.91**	.442
I discourage acupressure for treatment of PONV to patients	1	4	**3.90**	.450
I personally use acupressure for treatment of PONV	2	4	**3.78**	.533
I recommend acupressure for treatment of PONV to patients	2	4	**3.67**	.667
I recommend acupressure for treatment of PONV to my family and friends	1	4	**3.52**	.834
Acupressure is a safe treatment for PONV	1	4	**3.16**	.580
Acupressure is not a safe treatment for PONV	1	4	**3.13**	.595
I would like more educational opportunities regarding acupressure for PONV treatment	1	4	**2.99**	.601
Acupressure use can enhance comfort for patients postoperatively	1	4	**2.94**	.477
Acupressure does not enhance comfort for patients postoperatively	1	4	**2.87**	.511
Acupressure is not an effective treatment for PONV	1	4	**2.87**	.595
Acupressure is an effective treatment for PONV	1	4	**2.81**	.518
Acupressure use can have an impact on surgical outcome	1	4	**2.75**	.580
Acupressure use does not have an impact on surgical outcomes	1	4	**2.71**	.628

Legend: 1= Strongly disagree, 2 = Disagree, 3 = Agree, 4 = Strongly agree

Note: Reverse coding was performed for items that were negatively worded.

Higher scores indicate higher knowledge level and positive attitudes toward Acupressure use for PONV.

***The adapted scale has adequate reliability with a Cronbach's alpha reliability coefficient = .69 (DeVellis, 2017)**

Table 4. Analysis of Sociodemographic Variables Using Dichotomous Groupings

	Mean	Standard Deviation	P Value
Years Practicing			.466
0-10 years	45.63	3.078	
11-20 years and above	44.33	4.100	
Gender			.012*
Male	43.21	4.848	
Female	45.82	2.587	
Age			.492
20-49 years old	45.52	3.032	
50-69 years old	44.21	4.340	
Practice Setting			.112
CRNAs and Anesthesiologists	44.36	4.130	
CRNAs, SRNAs, and Anesthesiologists	45.78	2.816	

*p value <0.05 indicates statistically significant result.

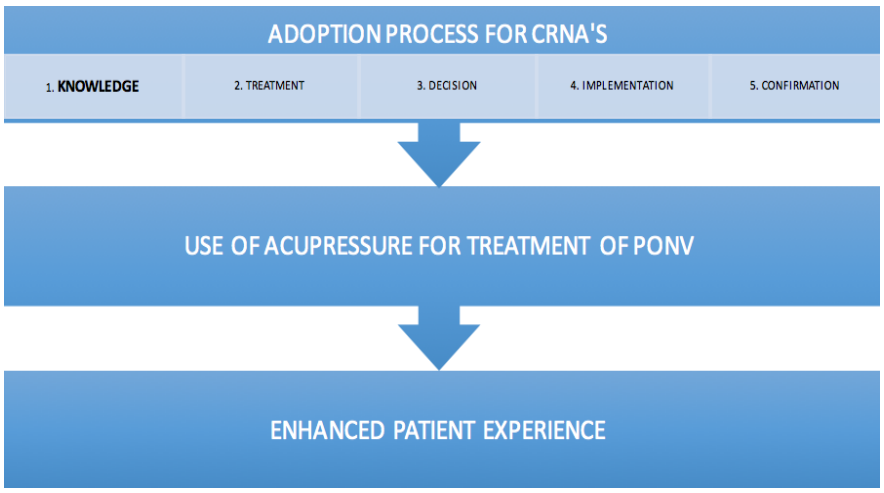

Figure 1. Conceptual Framework Based on Diffusion of Innovations Theory (Rogers, 1995)

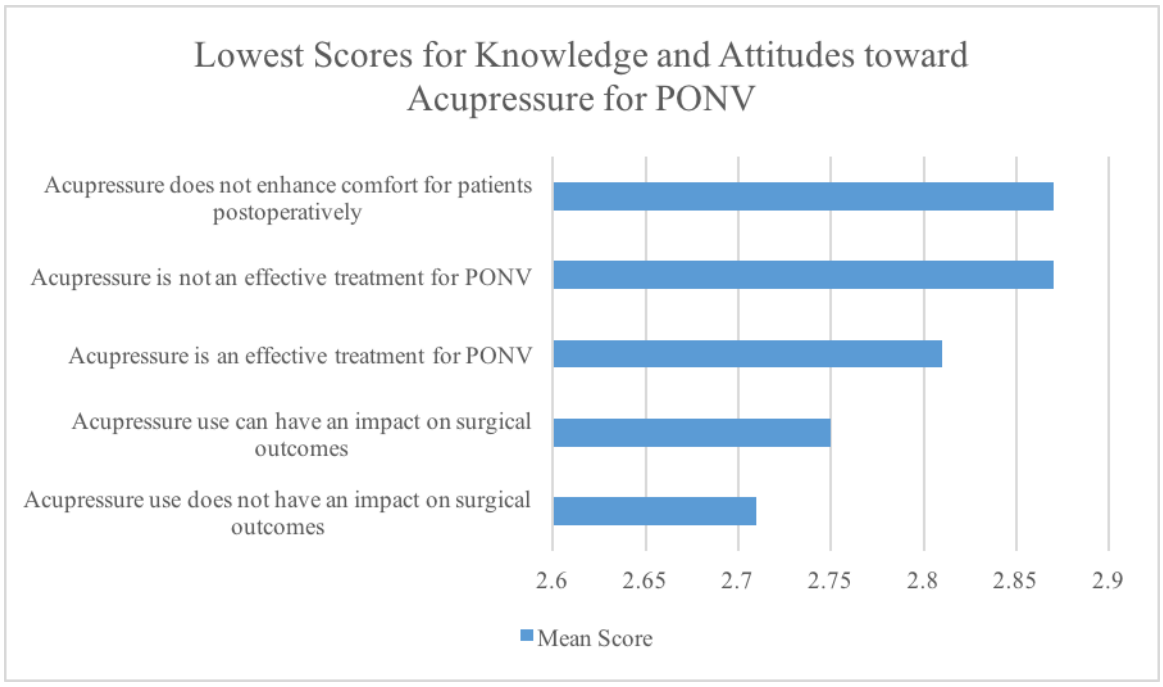

Figure 2. Items with Lowest Mean Scores for Knowledge and Attitudes Toward Acupressure for PONV

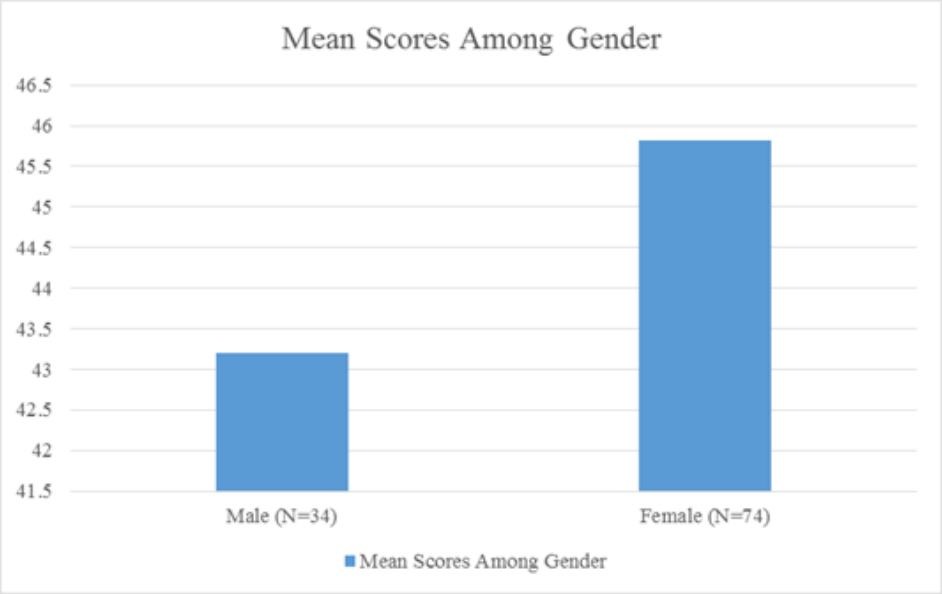

Figure 3. Mean Scores on PONV Knowledge and Attitudes by Gender

Appendix A

Information Sheet for Participation in Research Study

CRNA's Knowledge and Attitudes Regarding Acupressure as an Adjunct to Postoperative Nausea and Vomiting Prevention

Researchers: Kimberly Homa, RN, Graduate Student and Jacqueline Kuhn, RN, Graduate Student

Institution: DePaul University, Chicago, IL, USA

Committee Chair: Pamela Schwartz, CRNA, DNP, Administrative Director, NorthShore University HealthSystem School of Nurse Anesthesia

Committee Member: Young-Me Lee, PhD., Nursing Department, DePaul University

We are Kim Homa and Jackie Kuhn, senior student nurse anesthetists at NorthShore University HealthSystem School of Nurse Anesthesia. We are conducting a research study for our Doctorate of Nursing Practice through DePaul University under the supervision of Dr. Pamela Schwartz (PSchwartz@northshore.org) and Dr. Young-Me Lee (ylee23@depaul.edu).

We are conducting a research study to better understand CRNA's knowledge and attitudes regarding acupressure as an adjunct to postoperative nausea and vomiting prevention. The objectives of our study are to:

1. Assess the current level of knowledge regarding the use of acupressure for PONV treatment among CRNAs
2. Assess the current attitudes regarding the use of acupressure for PONV treatment among CRNAs
3. Design an educational handout to provide to CRNAs based on the results of our study

We are asking you to participate in our research study because you are a member of the Illinois Association of Nurse Anesthetists (IANA). If you agree to participate in the study, you will be asked to complete a survey. You will be provided a link to the survey via email through the secure website www.depaul.qualtric.com. The link will be available for a limited amount of time and should take about 10 minutes to complete.

The survey includes demographic information including years practicing as a CRNA, level of education completed, gender, age, race and ethnicity, and current anesthesia practice setting. Additionally, the survey includes questions about current knowledge of acupressure treatment, desire for education opportunities, and opinions on its effectiveness for PONV treatment.

Your participation is voluntary and you have the right to withdraw at any time without penalty. If you start the survey and change your mind afterwards, you may exit the survey without negative consequences. You have the option to skip questions you do not wish to answer.

Your responses will remain anonymous and the information obtained will only be used by the researchers for this study. No IP addresses will be collected. Data will be stored on a password protected computer for the duration of the project and will be deleted upon completion of our graduate program. Completion and submission of the survey will serve as your voluntary agreement to participate in the study.

Any questions, comments or concerns regarding this study can be forwarded to Kim Homa (kahoma@outlook.com), Jackie Kuhn (jacqueline.a.kuhn@gmail.com), Dr. Pamela Schwartz (PSchwartz@northshore.org), or Dr. Young-me Lee (ylee23@depaul.edu). If you have any questions regarding your rights as a research participant, you may contact Susan Loess-Perez, Director of Research Compliance at DePaul University at 312-362-7593 or at sloesspe@depaul.edu. If your questions have not been answered by the research team you may contact DePaul's Office of Research Services.

You may keep this information for your records.

Thank you for your consideration.

Appendix B

Survey

Section 1: Demographic Information

Directions: Circle the answer that pertains most appropriately to you.

How many years have you been a practicing CRNA?

1. 0- Student Registered Nurse Anesthetist
2. 1-3 years
3. 4-6 years
4. 7-10 years
5. 11-15 years
6. 15-20 years
7. >20 years

Circle the highest level of education you have completed.

1. Nursing diploma
2. Associate degree in nursing
3. Bachelor's degree in nursing
4. Master's degree in nursing
5. Doctorate degree (DNP, PhD, ND, DNSc, EdD)

What is your gender?

1. Male
2. Female

What is your ethnic origin?

1. White

2. Black, African, African American

3. Asian, Pacific Islander, Native Hawaiian

4. Hispanic, Latino, Spanish origin

5. American Indian or Alaskan Native

Please circle your age category

1. 20-29

2. 30-39

3. 40-49

4. 50-59

5. 60-69

6. 70+

Please mark the best description of your regular practice setting

1. CRNA only

2. CRNA and anesthesiologist

3. CRNA-students of anesthesia-anesthesiologist

Section 2: Knowledge and attitudes regarding the use of acupressure for PONV treatment

Direction: Circle the answer that pertains most appropriately to you.

I feel confident in my knowledge base of acupressure for PONV treatment

1. Strongly disagree

2. Disagree

3. Agree

4. Strongly agree

I would like more educational opportunities regarding acupressure for PONV treatment

1. Strongly disagree
2. Disagree
3. Agree
4. Strongly agree

Acupressure is not an effective treatment for PONV

1. Strongly disagree
2. Disagree
3. Agree
4. Strongly agree

Acupressure use can have an impact on surgical outcomes

1. Strongly disagree
2. Disagree
3. Agree
4. Strongly agree

Acupressure use can enhance comfort for patients postoperatively

1. Strongly disagree
2. Disagree
3. Agree
4. Strongly agree

Acupressure is a safe treatment for PONV

1. Strongly disagree
2. Disagree
3. Agree

4. Strongly agree

Acupressure use does not have an impact on surgical outcomes

1. Strongly disagree
2. Disagree
3. Agree
4. Strongly agree

Acupressure is an effective treatment for PONV

1. Strongly disagree
2. Disagree
3. Agree
4. Strongly agree

Acupressure does not enhance comfort for patients postoperatively

1. Strongly disagree
2. Disagree
3. Agree
4. Strongly agree

Acupressure is not a safe treatment for PONV

1. Strongly disagree
2. Disagree
3. Agree
4. Strongly agree

I personally use acupressure for treatment of PONV

1. Regularly

2. Occasionally

3. Rarely

4. Never

I recommend acupressure for treatment of PONV to my family and friends

1. Regularly

2. Occasionally

3. Rarely

4. Never

I discourage acupressure for treatment of PONV to my family and friends

1. Regularly

2. Occasionally

3. Rarely

4. Never

I recommend acupressure for treatment of PONV to patients

1. Regularly

2. Occasionally

3. Rarely

4. Never

I discourage acupressure for treatment of PONV to patients

1. Regularly

2. Occasionally

3. Rarely

4. Never

Appendix C

Recruitment Email

Dear IANA Member,

We, Kim Homa and Jackie Kuhn, are senior CRNA students at NorthShore University HealthSystem School of Nurse Anesthesia and DNP candidates at DePaul University in Chicago, IL. Your email address was obtained through the association, which we are members of as well.

We are conducting research on CRNA knowledge and attitudes toward the use of acupressure for management of post-operative nausea and vomiting (PONV). We have attached an informational sheet with a detailed description of our project. We would greatly appreciate your input for our project as there is little data available on this topic. If you choose to participate, you will be provided a link to a secure website (www.depaul.qualtrics.com) where you will be asked to complete a survey.

Sincerely,

Kim Homa & Jackie Kuhn

Appendix D

Institutional Review Board Approval Letters

DEPAUL
UNIVERSITY

Office of Research Services
Institutional Review Board
1 East Jackson Boulevard
Chicago, Illinois 60604-2301
312-362-7593
Fax: 312-362-7577

Research Involving Human Subjects

NOTICE OF INSTITUTIONAL REVIEW BOARD ACTION

To: Jacqueline Kuhn, BSN, Graduate Student, School of Nursing

Date: November 4, 2016

Re: Research Protocol # JK100616NUR
"Certified Registered Nurse Anesthetists (CRNA's) Knowledge and Attitudes Regarding Acupressure as an Adjunct to Postoperative Nausea and Vomiting Prevention"

Please review the following important information about the review of your proposed research activity.

Review Details
This submission is an initial submission.

Your research project meets [continues to meet] the criteria for Exempt review under 45 CFR 46.101 under the following category:

> *(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:*
> *(i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.*

Approval Details
Your research was originally reviewed on October 18, 2016 and revisions were requested. The revisions you submitted on November 4, 2016 were reviewed and approved on November 4, 2016.

> **Number of approved participants:** 300 Total
> ***You should not exceed this total number of subjects without prospectively submitting an amendment to the IRB requesting an increase in subject number.***
>
> **Funding Source:** 1) None.
>
> **Approved Performance sites:** 1) DePaul University.

Reminders
- Under DePaul's current institutional policy governing human research, research projects that meet the criteria for an exemption determination may receive administrative review by the Office of Research

Appendix E

Letter to IANA Administrator

Dear Micah Roderick,

Hello, we are Kim Homa and Jackie Kuhn, third year nurse anesthesia trainees at NorthShore University HealthSystem School of Nurse Anesthesia. We are currently working on our DNP project involving current knowledge and attitudes of CRNAs regarding the use of acupressure for postoperative nausea and vomiting prevention. As part of our project we would like to distribute a survey to CRNAs to obtain their thoughts on this practice. We are writing this letter seeking your permission and assistance in disseminating an email to the members of the IANA. IANA members would be given brief background information on the topic and provided a link to our survey if they wish to participate. If you have additional questions regarding our project, you may reach us at our contact information below. Thank you for your consideration and we look forward to hearing from you.

Sincerely,

Kim Homa and Jackie Kuhn

kahoma@outlook.com
jacqueline.a.kuhn@gmail.com

Appendix F

CITI Training

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COURSEWORK REQUIREMENTS REPORT*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Kimberly Homa (ID: 5555089)
- **Email:** kahoma@outlook.com
- **Institution Affiliation:** DePaul University (ID: 1435)
- **Phone:** 6307766909

- **Curriculum Group:** Students
- **Course Learner Group:** Students - Class projects
- **Stage:** Stage 1 - Basic Course

- **Report ID:** 19535596
- **Completion Date:** 05/15/2016
- **Expiration Date:** 05/15/2019
- **Minimum Passing:** 80
- **Reported Score*:** 88

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED	SCORE
History and Ethical Principles - SBE (ID: 490)	05/14/16	5/5 (100%)
Defining Research with Human Subjects - SBE (ID: 491)	05/15/16	4/5 (80%)
The Federal Regulations - SBE (ID: 502)	05/15/16	4/5 (80%)
Assessing Risk - SBE (ID: 503)	05/15/16	4/5 (80%)
Informed Consent - SBE (ID: 504)	05/15/16	4/5 (80%)
Privacy and Confidentiality - SBE (ID: 505)	05/15/16	5/5 (100%)
Students in Research (ID: 1321)	05/15/16	5/5 (100%)
Conflicts of Interest in Research Involving Human Subjects (ID: 488)	05/15/16	4/5 (80%)
DePaul University (ID: 12952)	05/15/16	No Quiz

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

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Phone: 305-243-7970
Web: https://www.citiprogram.org

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COURSEWORK TRANSCRIPT REPORT**

** NOTE: Scores on this Transcript Report reflect the most current quiz completions, including quizzes on optional (supplemental) elements of the course. See list below for details. See separate Requirements Report for the reported scores at the time all requirements for the course were met.

- **Name:** Kimberly Homa (ID: 5555089)
- **Email:** kahoma@outlook.com
- **Institution Affiliation:** DePaul University (ID: 1435)
- **Phone:** 6307766909

- **Curriculum Group:** Students
- **Course Learner Group:** Students - Class projects
- **Stage:** Stage 1 - Basic Course

- **Report ID:** 19535596
- **Report Date:** 05/15/2016
- **Current Score**:** 88

REQUIRED, ELECTIVE, AND SUPPLEMENTAL MODULES	MOST RECENT	SCORE
Students in Research (ID: 1321)	05/15/16	5/5 (100%)
History and Ethical Principles - SBE (ID: 490)	05/14/16	5/5 (100%)
Defining Research with Human Subjects - SBE (ID: 491)	05/15/16	4/5 (80%)
The Federal Regulations - SBE (ID: 502)	05/15/16	4/5 (80%)
Assessing Risk - SBE (ID: 503)	05/15/16	4/5 (80%)
Informed Consent - SBE (ID: 504)	05/15/16	4/5 (80%)
Privacy and Confidentiality - SBE (ID: 505)	05/15/16	5/5 (100%)
Conflicts of Interest in Research Involving Human Subjects (ID: 488)	05/15/16	4/5 (80%)
DePaul University (ID: 12952)	05/15/16	No Quiz

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

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COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 1 OF 2
COURSEWORK REQUIREMENTS*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Jacqueline Kuhn (ID: 5555114)
- **Email:** jacqueline.a.kuhn@gmail.com
- **Institution Affiliation:** DePaul University (ID: 1435)
- **Phone:** 8158239665

- **Curriculum Group:** Students
- **Course Learner Group:** Students - Class projects
- **Stage:** Stage 1 - Basic Course

- **Report ID:** 19535664
- **Completion Date:** 16-May-2016
- **Expiration Date:** 16-May-2019
- **Minimum Passing:** 80
- **Reported Score*:** 83

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED	SCORE
History and Ethical Principles - SBE (ID: 490)	14-May-2016	4/5 (80%)
Defining Research with Human Subjects - SBE (ID: 491)	14-May-2016	4/5 (80%)
The Federal Regulations - SBE (ID: 502)	14-May-2016	4/5 (80%)
Assessing Risk - SBE (ID: 503)	16-May-2016	5/5 (100%)
Informed Consent - SBE (ID: 504)	16-May-2016	3/5 (60%)
Privacy and Confidentiality - SBE (ID: 505)	16-May-2016	4/5 (80%)
Students in Research (ID: 1321)	16-May-2016	5/5 (100%)
Conflicts of Interest in Research Involving Human Subjects (ID: 488)	16-May-2016	4/5 (80%)
DePaul University (ID: 12952)	16-May-2016	No Quiz

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

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COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 2 OF 2
COURSEWORK TRANSCRIPT**

** NOTE: Scores on this Transcript Report reflect the most current quiz completions, including quizzes on optional (supplemental) elements of the course. See list below for details. See separate Requirements Report for the reported scores at the time all requirements for the course were met.

- **Name:** Jacqueline Kuhn (ID: 5555114)
- **Email:** jacqueline.a.kuhn@gmail.com
- **Institution Affiliation:** DePaul University (ID: 1435)
- **Phone:** 8158239665

- **Curriculum Group:** Students
- **Course Learner Group:** Students - Class projects
- **Stage:** Stage 1 - Basic Course

- **Report ID:** 19535664
- **Report Date:** 18-Aug-2016
- **Current Score**:** 85

REQUIRED, ELECTIVE, AND SUPPLEMENTAL MODULES	MOST RECENT	SCORE
Students in Research (ID: 1321)	16-May-2016	5/5 (100%)
History and Ethical Principles - SBE (ID: 490)	14-May-2016	4/5 (80%)
Defining Research with Human Subjects - SBE (ID: 491)	14-May-2016	4/5 (80%)
The Federal Regulations - SBE (ID: 502)	14-May-2016	4/5 (80%)
Assessing Risk - SBE (ID: 503)	16-May-2016	5/5 (100%)
Informed Consent - SBE (ID: 504)	16-May-2016	4/5 (80%)
Privacy and Confidentiality - SBE (ID: 505)	16-May-2016	4/5 (80%)
Conflicts of Interest in Research Involving Human Subjects (ID: 488)	16-May-2016	4/5 (80%)
DePaul University (ID: 12952)	16-May-2016	No Quiz

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

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Appendix G

Acupressure Educational Handout for CRNAs

Acupressure as an Adjunct to PONV Prevention

Key Points:

- Postoperative nausea and vomiting continues to be a problem for patients despite multimodal pharmacologic treatments available.
- A systematic review from the Cochrane Library including 59 trials and 7667 participants, Lee, Chan, and Fan (2015) concluded that the effect of P6 acupoint stimulation is comparable to antiemetics in the prevention of PONV.
- Although complementary and alternative medicine (CAM) therapies such as acupressure have demonstrated clinical usefulness, they have not yet transcended into mainstream anesthesia practice.
- Acupressure is thought to reduce nausea and vomiting by releasing endogenous beta-endorphins in the spinal cord which modify signals to the chemoreceptor trigger zone.
- The P6 acupressure point is located 2 inches proximal to the distal wrist crease between the palmaris longus and flexor carpi radialis tendons (Illustration 1).
- To be effective, Chernyak and Sessler (2005) suggest that acupressure should be administered before the emetic stimulus.

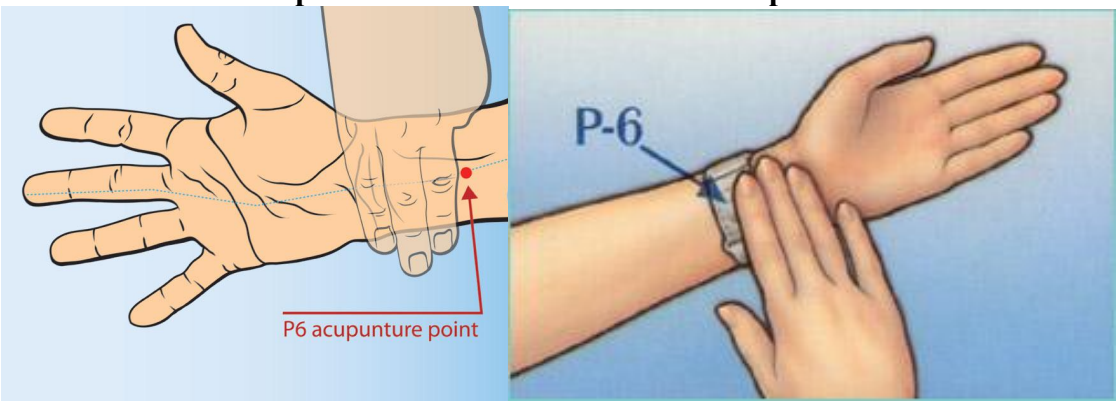
Data:

White and colleagues (2012) conducted a study on 100 patients undergoing laparoscopic surgery. The anesthetic was standardized and all patients were given ondansetron 4mg IV and dexamethasone 4mg IV intraoperatively. Half of the patients were given a "sham" acupressure device while the other half received an acupressure wristband prior to anesthesia induction. Results showed that vomiting from 0-72 hours postoperatively decreased from 30% to 12% in the acupressure group ($P = 0.03$, 95% confidence interval 2%-33%).

Direkvand-Moghadam and Khosravi (2013) found acupressure and metoclopramide to have comparable effects on PONV. In 102 patients undergoing elective cesarean section under spinal anesthesia, the incidence of vomiting decreased from 32.34% (11/34) in the control group to 17.64% (6/34) in the acupressure group and to 11.6% (4/34) metoclopramide group.

Soltani and colleagues (2010) compared the use of ondansetron, metoclopramide and acupressure for PONV prevention in patients undergoing strabismus surgery. The authors concluded that the incidence and severity among the groups were not significantly different and all had significant reductions from the placebo group.

Illustration 1. P6 Acupressure Point and Position of Acupressure Band



Bibliography

Chernyak, G. V., & Sessler, D. I. (2005). Perioperative acupuncture and related techniques. *Anesthesia, 102*(1), 1031-1049.

Direkvand-Moghadam, A. & Khosravi, A. (2013). Nausea and vomiting in cesarean section: A randomized controlled trial. *Journal of Clinical and Diagnostic Research, 7*(10), 2247-2249.

Faircloth, A. (2015). Acupuncture: History from the yellow emperor to modern anesthesia practice. *American Association of Nurse Anesthetists Journal, 83*(4), 289-295.

Hickman, A. G., Bell, D. M., & Preston, J. C. (2005). Acupressure and postoperative nausea and vomiting. *American Association of Nurse Anesthetists Journal, 73*(5), 379-385.

Mamaril, M. E., Windle, P. E., & Burkard, J. F. (2006). Prevention and management of postoperative nausea and vomiting: A look at complementary techniques. *Journal of PeriAnesthesia Nursing, 21*(6), 404-410.

Soltani, A. E., Mohammadinasab, H., Goudarzi, M., Arbabi, S., Mohtaram, R., Afkham, K., ... Darabi, M. E. (2010). Acupressure using ondansetron versus metoclopramide on reduction of postoperative nausea and vomiting after strabismus surgery. *Archives of Iranian Medicine, 13*(4), 288-293.

White, P. F., Zhao, M., Tang, J., Wender, R. H., Yumul, R., Sloninsky, A. V., … Cunneen, S. (2012). Use of a disposable acupressure device as part of a multimodal antiemetic strategy for reducing postoperative nausea and vomiting. *Anesthesia & Analgesia, 115*(1), 31-37.

References

Adib-Hajbaghery, M., Etri, M. Hosseainian, M., & Mousavi, M. (2013). Pressure to the P6 acupoint and post-appendectomy pain, nausea, and vomiting: A randomized clinical trial. *Journal of Caring Sciences*, *2*(2), 115-122.

Agarwal, A., Bose, N., Gaur, A., Singh, U., Gupta, M. K., & Singh, D. (2002). Acupressure and ondansetron for postoperative nausea and vomiting after laparoscopic cholecystectomy. *Canadian Journal of Anesthesia*, *49*(6), 554-560.

Alkaissi, A., Evertsson, K., Johnsson, V., Ofenbartl, L., & Kalman, S. (2002). P6 acupressure may relieve nausea and vomiting after gynecological surgery: An effectiveness study in 410 women. *Canadian Journal of Anesthesia*, *49*(10), 1034-1039.

Al Mansour, M. A., Al-Bedah, A. M., Airukban, M. O., Elsubai, I. S., Mohamed, E. Y., El Olemy, A. T., … Qureshi, N. A. (2015). Medical students' knowledge, attitude, and practice of complementary and alternative medicine: A pre- and post-exposure survey in Majmaah University, Saudi Arabia. *Advances in Medical Education and Practice, 6*, 407-420. doi:10.2147/AMEP.S82306

Brolinson, P. G., Price, J. H., Ditmyer, M., & Reis, D. (2001). Nurse's perceptions of complementary and alternative medical therapies. *Journal of Community Health, 26*(3), 175-189.

Chatterjee, S., Rudra, A., & Sengupta, S. (2011). Current concepts in the management of postoperative nausea and vomiting. *Anesthesiology Research and Practice, 12*(1), 1-10.

Cheong, K. B., Zhang, J., Huang, Y. & Zhang, Z. (2013). The effectiveness of acupuncture in prevention and treatment of postoperative nausea and vomiting: A systematic review and meta-analysis. *Plos One, 8*(12), 1-17.

Chernyak, G. V., & Sessler, D. I. (2005). Perioperative acupuncture and related techniques. *Anesthesia*, *102*(1), 1031-1049.

DeVellis, R. F. (2017). *Scale development: Theory and applications* (4th ed.). Thousand Oaks, CA: Sage.

Dibble, S. L., Luce, J., & Cooper, B. A., (2007). Acupressure for delayed chemotherapy induced nausea & vomiting: A randomized clinical trial. *Oncology Nursing Forum, 34*(4), 813-826.

Direkvand-Moghadam, A. & Khosravi, A. (2013). Nausea and vomiting in cesarean section: A Randomised controlled trial. *Journal of Clinical and Diagnostic Research*, *7*(10), 2247-2249.

Doane, D. P. & Seward, L.E. (2011). Measuring skewness: A forgotten statistic? *Journal of Statistics Education, 19*(2), 1-18.

Faircloth, A. (2015). Acupuncture: History from the yellow emperor to modern anesthesia practice. *American Association of Nurse Anesthetists Journal*, *83*(4), 289-295.

Gan, T.J., Meyer, T. A., & Apfel, C.C. (2007). Society for ambulatory anesthesia guidelines for the management of postoperative nausea and vomiting. *Anesthesia Analog*, *105*(6), 1615-1628.

Hickman, A. G., Bell, D. M., & Preston, J. C. (2005). Acupressure and postoperative nausea and vomiting. *American Association of Nurse Anesthetists Journal*, 73(*5*), 379-385.

Holmér Pettersson, P., & Wengström, Y. (2012). Acupuncture prior to surgery to minimize postoperative nausea and vomiting: A systematic review. *Journal of Clinical Nursing*, *21*(13), 1799-1805.

International Business Machines. (2017). *IBM SPSS statistics.* Retrieved from

http://www.ibm.com/analytics/us/en/technology/spss/

Karlsson, A., Lindgren, L., Bergenheim, T., & Koskinen, L. O. (2015). The efficacy of P6 acupressure with sea-band in reducing postoperative nausea and vomiting in patients undergoing craniotomy: A randomized, double-blinded, placebo-controlled study. *Journal of Neurosurgical Anesthesiology, 27*(1), 42-50.

Lee, A., Chan, S. K., & Fan, L. T. (2015). Stimulation of the wrist acupuncture point PC6 for preventing postoperative nausea and vomiting. *Cochrane Database of Systematic Reviews, 11*, 1-164. DOI: 10.1002/14651858.CD003281.pub4.

Lee, J., Dodd, M., Dibble, S., & Abrams, D. (2008). Review of acupressure studies for chemotherapy-induced nausea and vomiting control. *Journal of Pain and Symptom Management, 36*(5), 529-544.

Majholm, B., & Moller, A. M., (2011). Acupressure at acupoint P6 for prevention of postoperative nausea and vomiting: a randomised clinical trial. *European Journal of Anaesthesiology, 28*(6), 412-419.

Mamaril, M. E., Windle, P. E., & Burkard, J. F. (2006). Prevention and management of postoperative nausea and vomiting: A look at complementary techniques. *Journal of PeriAnesthesia Nursing, 21*(6), 404-410.

March, A. & McCormack, D. (2009). Modifying Kolcaba's comfort theory as an institution-wide approach. *Holistic Nursing Practice, 23*(2), 75-80.

Medical-Dictionary Online. (2016). "*Nausea" & "Vomiting*". Retrieved April 16, 2016 from www.medical-dictionary.thefreedictionary.com

Ming, J., Kuo, B. I., Lin, J. & Lin, L. (2002). The efficacy of acupressure to prevent nausea and vomiting in post-operative patients. *Issues and Innovations in Nursing Practice, 39*(4),

343-351.

National Center for Complementary and Alternative Medicine. (2016). *Exploring the science of complementary and alternative medicine.* Retrieved from https://nccih.nih.gov/sites/nccam.nih.gov/files/NCCAM_SP_508.pdf

Noroozinia, H., Mahoori, A., Hasani, E., Gerami-Fahim, M. & Sepehrvand, N. (2013). The effect of acupressure on nausea and vomiting after cesarean section under spinal anesthesia. *Acta Medica Iranica*, *51*(3), 163-167.

Oxford Dictionary (2016). "Qi". Retrieved May 22, 2016 from http://www.oxforddictionaries.com/us/definition/american_english/qi

Rogers, E. M. (1995). *Diffusion of innovations* (4 ed.). New York: Free Press.

Soltani, A. E., Mohammadinasab, H., Goudarzi, M., Arbabi, S., Mohtaram, R., Afkham, K., ... Darabi, M. E. (2010). Acupressure using ondansetron versus metoclopramide on reduction of postoperative nausea and vomiting after strabismus surgery. *Archives of Iranian Medicine, 13*(4), 288-293.

Temple, M., Fagerlund, K., & Saewyc, E. (2005). A national survey of certified registered nurse anesthetists' knowledge, beliefs, and assessment of herbal supplements in the anesthesia setting. *American Association of Nurse Anesthetists Journal, 73*(5), 368-377.

Turgut, S., Ozalp, G., Dikmen, S., Savli, S., & Tuncel, G., (2007). Acupressure for postoperative nausea and vomiting in gynaecological patients receiving patient-controlled analgesia. *European Journal of Anesthesia, 24*(1), 87-91.

White, P. F., Zhao, M., Tang, J., Wender, R. H., Yumul, R., Sloninsky, A. V., … Cunneen, S. (2012). Use of a disposable acupressure device as part of a multimodal antiemetic strategy for reducing postoperative nausea and vomiting. *Anesthesia & Analgesia*,

115(1), 31-37.