

Quality Improvement Project Utilizing Aromatherapy for the Treatment of Postoperative Nausea and Vomiting

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Abstract

Background/Purpose: Postoperative nausea and vomiting (PONV) is a prominent patient dissatisfier after surgery which can negatively impact a patient's recovery and satisfaction. Aromatherapy utilization has historically been regarded as a holistic Eastern therapy and less as a helpful adjunct to traditional Western medication. The literature surrounding aromatherapy has shown effectiveness and positive patient experience as an adjunctive therapy to help combat PONV. However, it is an overlooked therapy often underutilized compared to traditional antiemetic medications in the postoperative setting. This DNP project aimed to conduct a quality improvement educational workshop to see if education on this therapy would lead to improved knowledge and use of aromatherapy in the clinical setting.

Method: This quality improvement project was conducted at McLaren Flint Hospital. Education was provided to the anesthesia and postoperative nursing staff. A pretest and posttest design was utilized to assess change in knowledge and attitudes involving the utilization of aromatherapy. These tests included six knowledge-based multiple-choice questions and four subjective questions utilizing a 5-point Likert scale and fill-in-the-blank to assess the practitioners' attitudes and perceptions on using aromatherapy to manage and prevent PONV. The data obtained from these tests were compiled and submitted into SPSS software to assess the statistical significance of the education provided.

Results: A total of 25 staff members who received the education submitted tests. The results indicated that an increase of knowledge occurred between the pretest (Mean = 3.8, SD = 1.06) and the posttest (Mean = 5.6, SD = .76), $Z = -4.16$, $P < .001$) for the knowledge-based questions. When participants were asked how likely they would utilize aromatherapy as a first-line therapy to treat nausea in the hospital setting, there was an increase in mean scores from the pretest

(2.88) to the posttest (3.84) with a Wilcoxon signed rank test ($p = .002$). Although the educational workshop showed improved knowledge and attitude scores, the usage of aromatherapy decreased within the timeframe (two months before education vs. two months after).

Discussion/Conclusion: This project suggests that education on aromatherapy increases knowledge and improves attitudes/perceptions toward its beneficial use for PONV in the clinical setting. This project signifies that further education is warranted to increase the use and adaptability of aromatherapy in the postoperative environment.

Quality Improvement Project Utilizing Aromatherapy for the Treatment of Postoperative Nausea and Vomiting

Background and Significance

Introduction

Postoperative nausea and vomiting (PONV) are a prominent patient dissatisfier after surgery and has been rated worse than postoperative pain by some patients. Postoperative nausea and vomiting are defined as unpleasant feelings in the stomach with a sensation to retch or vomit that occurs within 24-48 hours after surgery (Elvir-Lazo et al., 2020). Thirty percent of all post-surgical patients (up to 80% in high-risk patients) develop postoperative nausea and vomiting after general anesthesia despite antiemetic medication administration (Elvir-Lazo et al., 2020). Postoperative nausea and vomiting may lead to dehydration, electrolyte imbalances, and more detrimental outcomes, such as pulmonary aspiration that leads to chemical pneumonitis, all of which increases hospital costs and length of stay. Parra-Sanchez et al., 2012 found an increased cost of 75 dollars for each patient that experienced PONV. Additionally, only 49% of patients with PONV rated their postoperative satisfaction highly versus 94% without PONV rating their satisfaction high. For many patients, this is a significant indicator of how they view their satisfaction with the anesthesia. It is still unknown why postoperative nausea and vomiting occur; however, the risk factors involve a history of motion sickness or nausea and vomiting in the postoperative setting, female gender, administration of inhalation anesthetic agents and opioids, and specific types of procedures (Choi, 2016).

The proposed objective was to conduct a quality improvement DNP project on postoperative nausea protocols and educate patients and staff on the benefit of these protocols in the post-operative setting utilizing aromatherapy devices or techniques. According to current

evidence in literature, subjects receiving aromatherapy in addition to prophylactic antiemetic medications will have lower postoperative nausea and vomiting scores than subjects treated with prophylactic antiemetic medication alone (Abril et al., 2019). This DNP project has the potential to be a valuable tool to facilitate a paradigm shift away from the sole utilization of traditional antiemetic medications within healthcare facilities. Additionally, this project assessed healthcare workforce knowledge and acceptance of the proposed therapies into practice. The primary objective of interest was if aromatherapy education would increase knowledge and improve attitudes of aromatherapy use in the clinical setting. Secondary objectives include increased use of aromatherapy products in the clinical setting and increased adaptability into healthcare practice.

Literature Review

Postoperative nausea and vomiting are associated with high incidence and poor outcomes. Therefore, it is important to find alternative strategies to combat these negative outcomes. The aim of this literature review is to answer the question: in patients undergoing general anesthesia, does the use of antiemetic medication with adjunctive aromatherapy versus antiemetic medication alone decrease post-operative nausea and vomiting?

Methods

A systematic search of the evidence was performed utilizing the databases CINAHL Complete and PubMed. These databases were accessed through the Oakland University online library. The search terms included, “Aromatherapy and/or essential oils AND postoperative nausea and vomiting”. Limit criteria set on this search included a time span from 2012 to 2021 to obtain more data for a comprehensive review related to the limited number of studies performed on this topic. Additionally, studies that were conducted on animals were avoided and only human

trials were selected. Research articles that were published in academic journals written in the English language with the adult patient population were inclusion criteria. Exclusion criteria included the pediatric population and articles that did not have available full-text options.

Results

There were 52 research articles obtained from the search of the nursing databases. A review of the 52 articles revealed 9 duplicate articles leaving 43 remaining. Thirty-one of the remaining articles were excluded for focusing on pediatric nausea and vomiting management, alternate methods of controlling postoperative nausea and vomiting other than aromatherapy or essential oils, not written in the English language, and not available in a full-text option. In total, 12 articles met the inclusion criteria and were selected as eligible articles for this literature review. From these 12 selected studies, there are 4 randomized controlled trials (Ferruggiari et al., 2012; Hodge et al., 2014; Maghami et al., 2020; Stalling-Welden et al., 2018), 3 quasi-experimental designs (Briggs et al., 2016; Ferruggiari et al., 2012; Karsten et al., 2020), one pilot study (Abril et al., 2019), one quality improvement project (Brown et al., 2018), one pretest-posttest research design (Lane et al., 2012), one prospective exploratory study (Mcilvoy et al., 2015), and one systematic review (Asay, et al., 2018).

Postoperative Nausea and Vomiting Treatment

The aim of this review was to identify if aromatherapy was found to decrease postoperative nausea and vomiting. Of the twelve articles, seven showed that aromatherapy significantly reduced postoperative nausea and vomiting ($p < 0.05$) (Briggs, et al., 2016; Brown et al., 2018; Fearington et al., 2019; Hodge et al., 2014; Lane et al., 2012; Maghami et al., 2020; Mcilvoy et al., 2015), three indicated that aromatherapy was beneficial but was not statistically significant due to low sample sizes (Abril et al., 2019; Ferruggiari et al., 2012; Karsten et al.,

2020), one found no statistically significant difference in aromatherapy versus traditional antiemetic medications to treat postoperative nausea and vomiting (Stalling-Welden et al., 2018), and one systematic review concluded that the majority of reviewed articles determined statistical significance when utilizing aromatherapy to decrease the incidence of postoperative nausea and vomiting when appropriate sample sizes were obtained (Asay et al., 2018).

Aromatherapy as Independent Intervention. Eight articles focus on the utilization of aromatherapy as the independent intervention to treat postoperative nausea (Briggs et al., 2016; Brown et al. 2018; Ferruggiari et al., 2012; Hodge et al., 2014; Karsten et al., 2020; Lane et al., 2012; Maghami et al., 2020; Stallings-Welden et al., 2018). Most of these articles compared the effectiveness of aromatherapy (intervention group) versus standard antiemetic medications (control group) and a placebo group (Ferruggiari et al., 2012; Lane et al., 2012), or without a placebo group (Brown et al., 2018; Hodge et al., 2014; Stallings-Welden et al., 2018). Ferruggiari et al. (2012) utilized peppermint aromatherapy via a handheld inhaler device to evaluate its effectiveness on postoperative nausea and vomiting. This study indicated no statistically significant difference in postoperative nausea and vomiting measurements between intervention groups; however, the peppermint aromatherapy group showed a lower average rating of nausea scores and the largest decrease in postoperative nausea scores at the 10-minute period. Lane et al. (2012) used peppermint aromatherapy to combat PONV in patients following C-Section surgery. They found that the use of peppermint aromatherapy was an effective therapy as evidenced by statistically significant decreases in patient reported nausea at 2 and 5-minutes post-therapy compared with Ondansetron and Promethazine groups. This was evidenced by 14 patients rating none to low levels of nausea at 2-minutes and 17 patients reporting none-low levels of nausea at 5-minutes out of the initial 22 participants with no change of nausea scores

within the standard antiemetic group. Brown et al. (2018) conducted a quality improvement project that utilized orange and peppermint aromatherapy patches to treat postoperative nausea and vomiting and compared it to the traditional antiemetic medication Zofran. The results showed a statistically significant decrease in nausea scores in 70% of the participants ($p < 0.01$). The remaining 30% of participants did not report any increased nausea scores. Hodge et al. (2014) found that patient nausea treated with QueaseEase aromatherapy inhalers improved PONV scores in a statistically significant manner ($p < 0.01$) with a higher statistically significant perceived effectiveness compared to the placebo group ($p < 0.001$). Stallings-Welden et al. (2018) found no statistical significance between aromatherapy and standard care modalities; however, both groups had high satisfaction scores with their associated treatments indicating aromatherapy is equally as effective in the treatment of nausea as standard care interventions. One article assessed the effectiveness of aromatherapy (independent variable) versus nausea (dependent variable) without a control group indicating average nausea ratings before the intervention was 3.29. Two minutes after the intervention, the average nausea rating was 1.44. These ratings showed a statistically significant decrease in nausea ratings (Briggs et al., 2016). Lastly, another article assessed decreased usage of traditional antiemetic medication administration after essential oil therapy and found that the aromatherapy group received less antiemetic medication (10%) than the control group (10%) (Karsten et al., 2020). These various examples show how versatile aromatherapy can be when implemented into our practice.

Adjunctive Aromatherapy with Traditional Medication. Aromatherapy was utilized adjunctively with traditional antiemetic medications (Ondansetron and Dexamethasone) in two of the twelve articles (Abril et al., 2019; Fearington et al., 2019). Abril et al. (2019) conducted a pilot study to assess effectiveness of inhaled peppermint aromatherapy in women undergoing

laparoscopic abdominal surgery. The second article conducted a prospective and retrospective cross-sectional design with subjects randomly assigned and double blinded to the allotted groups (peppermint, ginger, or a combination) (Ferrarington et al., 2019). Of the two articles, one found a decreased severity of nausea; however, the study did not show statistical significance related to a low sample size (Abril et al., 2019). and one reduced the need of antiemetic medications in a statistically significant manner (Ferrarington et al., 2019).

Patient Reported Nausea. Nausea is a subjective finding that was the measurement of interest used to discover correlations in the effectiveness of aromatherapy as an intervention. All articles included in this review utilized patient-reported subjective data to measure nausea levels prior to and post-intervention to determine aromatherapy effectiveness. However, measurement tools varied drastically between these studies. Among these articles, the most common tool to measure nausea in the postoperative setting was a version of a five-point ordinal Likert scale (0 = no nausea, 1 = no nausea/anticipated nausea, 2 = mild nausea, 3 = moderate nausea, 4 = great nausea, and 5 = severe nausea) (Briggs et al., 2016; Brown et al., 2018; Karsten et al., 2020; Stallings-Welden et al., 2018). Four other articles utilized verbal ordinal scales to measure nausea, however, two used a 10-point scale (Hodge et al., 2014; Mcilvoy et al., 2015), one used a 3-point scale (Ferrarington et al., 2019), and the other a 6-point scale (Lane et al., 2012). Only one article assessed vomiting frequency along with nausea severity, frequency, and duration with a 100-point scale in four-hour intervals within a 12-hour time frame (Meghami et al., 2020). The remaining articles (excluding systematic reviews) utilized visual analogue scales with a 0-200 scale (Ferruggiari et al., 2012) and a 4-point scale (Abril et al., 2019). Additionally, there was variability in reassessment parameters following the baseline nausea assessment and group-specific intervention. The most common assessment periods from the studies were 2 minutes

after intervention and again at 5 minutes, or 5 minutes after intervention then again at 10 minutes. Although large variability of measurement tools is evident, the authors' conclusions amongst the articles consistently favor the utilization of aromatherapy related to findings that support decreased subjective nausea scores even if the results were statistically insignificant.

Delivery Methods. Aromatherapy can be delivered in a variety of ways demonstrating the versatility and ease of administration. Most of these trials used essential oil handheld sniffer/nasal inhaler devices in the postoperative setting (Abril et al., 2019; Briggs et al., 2016; Fearrington et al., 2019; Hodge et al., 2014; Mcilvoy et al., 2015). Various other strategies included aromatherapy patches on the gown or skin (Brown et al., 2018), cotton balls with essential oil drops (Karsten et al., 2020), inhaled vapors prepared in bags for the postoperative setting (Ferruggiari et al., 2012; Lane et al., 2012), and nebulized scents through the endotracheal tube prior to emergence from general anesthesia (Maghami et al., 2020). These variable delivery methods are all effective for this review; however, differentiating effectiveness between these methods may be beneficial for research projects in the future.

Aromatherapy for Post-Discharge Nausea and Vomiting. Aromatherapy anti-emetic benefits extend beyond the immediate postoperative setting and should be considered for the patient after discharge. Two of the twelve studies discussed the secondary outcome of treating post-discharge nausea with aromatherapy (Mcilvoy et al., 2015; Stallings-Welden et al., 2018). Mcilvoy et al. (2015) concluded that of 70 participants, 25 (35%) developed post-discharge nausea. All episodes of reported nausea improved with the aromatherapy intervention as evidenced by a mean decrease in nausea scores of 4.78 +/- 2.12 (0-10 scale). Twenty-two of those episodes treated with the QueaseEase inhaler resulted in a nausea score of 0 post intervention. Stallings-Welden et al. (2018) concluded that of the 64 participants interviewed

post-discharge, 6 participants from the aromatherapy intervention and 5 from the standard care group developed post-discharge nausea. Each patient of the aromatherapy group (100%) achieved relief from their symptoms after supplemental aromatherapy intervention while only 65% achieved relief from alternate nausea management techniques (soda, acetaminophen, antacids, crackers, and laying quietly without moving). These types of studies can be important because aromatherapy can be utilized in the perioperative, inpatient, and post-discharge settings and does not require a prescription.

Antiemetic Sparing. Antiemetic medications are associated with undesirable side effects such as sedation or QT interval prolongation leading to severe cardiac arrhythmias (torsades de pointes). These side effects lead to extended recovery times and worsen patient outcomes. Aromatherapy has a rapid onset and is an alternative therapy without any reported side effects that could provide healthcare cost savings due to decreased recovery times and avoidance of cardiac arrhythmias. Two of the included articles discussed aromatherapy's effect on antiemetic medication frequency (Farrington et al., 2019; Karsten et al., 2020). Karsten et al. (2020) conducted a study to investigate if preemptive aromatherapy would decrease the need for antiemetics in the first hour. They found 14% of patients in the control group required postoperative antiemetics and only 10% of patients in the group that received preemptive aromatherapy required additional antiemetics. Additionally, they found that those that received preemptive aromatherapy had less severe nausea—not statistically significant but clinically significant. Similarly, Farrington et al. (2019) determined that there was a significant decrease in doses of antiemetics used per person in their aromatherapy intervention group compared to the control group ($p < .001$). Not only does preemptive aromatherapy decrease the amount of rescue antiemetics patients require, but it also decreases the severity of their nausea. Although the study

performed by Karsten et al. (2020) did not find statistical significance due to the low sample sizes, the clinical significance is there.

Patient Satisfaction. Three articles evaluated patient satisfaction with their designated therapy. Briggs et al. (2016) assessed satisfaction of peppermint essential oils in managing postoperative nausea and vomiting, resulting in a 93% positive patient experience. Additionally, 90% of patients agreed that aromatherapy should be used for future nausea management. The remaining two articles assessed the satisfaction of aromatherapy interventions versus traditional interventions or placebo groups (Hodge et al., 2014; Stallings-Welden et al., 2018). These articles found similar satisfaction and effectiveness ratings among the treatment arms without a significant difference between groups. This can be related to the satisfaction of overall symptom relief being as important as the intervention used. Patients experiencing nausea relief in placebo groups can be related to the controlled breathing techniques utilized with the inhaling devices falsely improving nausea outcomes. However, perceived effectiveness was higher in the treatment group. Patient satisfaction and positive outcomes are the core of healthcare research and quality improvement initiatives, thus, a crucial component to this project.

Trends in Literature

Although not all the provided articles show statistical significance, all articles described the benefits of utilizing some form of aromatherapy delivery. Variability in the literature is present related to a variety of patient risk factors for postoperative nausea and vomiting along with varying essential oil blends and methods of their delivery. Additionally, certain types of procedures may trigger more nausea and vomiting postoperatively than others. For these reasons, it is difficult to come to a definitive decision on the usefulness of aromatherapy. More research must be conducted to narrow down its place in the field of anesthesia. Current findings suggest

that aromatherapy should be implemented as an adjunctive therapy to decrease rates of postoperative nausea and vomiting until more specific studies with larger sample sizes can be conducted. Despite these findings, very few healthcare facilities provide essential oils or aromatherapy outside of controlled trials or provide postoperative discharge education on the use of these therapies at home. See the evaluation table (Appendix A) for a comprehensive analysis of the findings for each article reviewed.

Limitations

Most articles in this literature review discussed small sample sizes as limitations of the studies conducted; however, they did not eliminate relevance as most achieved statistical significance. Additionally, many studies were performed in a single healthcare facility which may not represent a sample with the demographic data of the entire population. This indicates that future studies must to be conducted on a larger scale between multiple healthcare systems. Many of these studies lacked a control or placebo group for comparison to evaluate the effectiveness of aromatherapy. When a control or placebo group is not utilized, participants may experience increased stress in response to not receiving any additional therapies as participants would be able to sense an absence of an aroma in their treatment. Suggested solutions for future studies to explore would be to add lemon juice or similar odor into the placebo groups aromatherapy treatment (Farrington et al., 2019). A difficult element to measure is the variability of surgical procedures and their unique involvement in postoperative nausea and vomiting. Thus, different anesthesia delivery procedures and methods need to be individually assessed in future clinical trials to account for the variability of postoperative nausea and vomiting between these cases.

These authors are not free from bias as there is some stake in having positive results related to the utilization of aromatherapy on postoperative nausea and vomiting for relevance to the future implementation of this project. However, no relevant articles were excluded and findings from these trials were portrayed accurately to prevent any bias.

Implications

The benefits of aromatherapy can be of use in the field of nursing across various settings, especially in the post-anesthesia care units. However, these therapies have yet to be utilized to their full potential related to the preference of traditional medical treatments. Aromatherapy can be utilized in the medical field as an additional tool to combat postoperative nausea and vomiting. According to Abril et al. (2019), “multimodal approaches to pain management are well accepted, and may be extended to PONV with recent evidence supporting nonpharmacologic treatment” (p. 379). This helps predict the potential increase in the utilization of these integrative approaches to patient care in the future of nursing. Also, this therapy can be utilized in the postoperative setting without needing prescriptions or physician orders that can delay the treatment of nausea symptoms. Self-administration of these medications can give patients more autonomy in their recovery period which may improve patient experiences, health-related outcomes, decreased length of stays, and quality of life after surgery. Lastly, coadministration of aromatherapy and avoidance of additional doses of antiemetic medications leads to less harmful adverse effects that have been documented with the administration of antiemetic medications.

Conclusion

The primary objective of this DNP project was to conduct a quality improvement initiative in a postoperative setting to answer the question: In the postoperative setting, will education to the healthcare team regarding aromatherapy increase knowledge of this therapy to

treat post-operative nausea and vomiting? Secondary objectives include assessing the adaptability of aromatherapy and increasing its use in healthcare practice.

Conceptual Framework

Aromatherapy utilization in healthcare is regarded more as a holistic treatment and less as a traditional medication. Nursing theories have traditionally focused on modern medications and treatments to provide optimal health care outcomes in practice; however, more focus needs to be placed on effective alternative treatments options. The supporting theory that correlates with this topic is the theory of the unitary human being proposed by Martha Rodgers. In this theory, the patient's whole self is considered during the healthcare process (mind, body, and spirit). An individualized approach to the healing process is used and each patient is considered a unique individual with specific needs in relation to their healing process. The plan of care is created with complementary treatments within a multidisciplinary, team-based model with the patient as an equal contributor in the decision-making process (Valizadeh et al., 2017).

Integrative medicine is a healthcare concept that utilizes the theoretical framework of the unitary human being while combining the accepted traditional medication model. Integrative medicine is a form of medical practice that incorporates complementary or alternative elements of medicine to create a comprehensive treatment plan in conjunction with traditional methods that are solely based off diagnoses and treatments. This synergistic patient-based model incorporates mind, body, and spirit into the healing process (Rees & Weil, 2001).

Project Methodology

Design

This project was a quality improvement project with the aim to improve PONV treatment modalities and improve nursing knowledge of treatment options to optimize patient-reported

nausea levels in the postoperative setting. This project included a pre-test and post-test design to assess the effectiveness of presentations provided to the staff. Education was provided to the anesthesia and PACU staff through a PowerPoint presentation with a live lecture. The PACU and anesthesia staff were then given a post-test along with a survey assessing current use of aromatherapy, barriers to its administration, and thoughts and experiences with the aromatherapy treatments. Those who were unable to attend this live lecture were offered the opportunity to complete a Qualtrics module comprised of a pre-test, recorded video presentation, and post-test. Quease Ease inventory from inventory control was reviewed two months before education. A post-education assessment of inventory was performed two months post-education to assess the effectiveness of the education materials.

Sample and Setting

This quality improvement project was conducted at McLaren Flint Hospital located in Flint, Michigan. This facility has fifteen operating rooms, one hybrid room, five heart and vascular rooms, two endoscopy suites, and one cesarian section operating room. All post-operative care areas including heart and vascular, obstetrics, endoscopy, and general surgery will be provided the education. All postoperative nursing staff and anesthesia staff members were given the option to be included in the education process. Staff members that were provided education and questionnaires included PACU registered nurses and anesthesia providers.

Recruitment

The educational component of this quality improvement project was provided to the postoperative nursing and anesthesia teams in person at a monthly staff meeting. An email with directions to complete the Qualtrics module was sent by the PACU manager to staff members

that were not in attendance at the live meeting. There was not any compensation for the completion of this questionnaire.

Key Stakeholders

The key stakeholders to this project are the staff members that were provided the pre-test, education, and post-test. Without their cooperation, there would be no way to complete this quality improvement project. Team leaders Linda McDonald CRNA, DNAP, Melissa Grobbel RN-BSN, PACU manager, Dr. Rusin MDA, and Nicole Wesley CRNA, MS were essential to the implementation of this project. Resources necessary for this quality improvement project included faculty email addresses, total number of employees within the postoperative care unit and anesthesia department, time allotted to provide education, the Qualtrics survey website, and access to inventory and purchasing records of essential oils pre- and post-intervention.

Study Design and Implementation Plan

The plan for this project included the development of a pre-test questionnaire to gather baseline data on the staff's knowledge regarding aromatherapy. This was completed utilizing in-person paper testing as well as online via the Qualtrics website. Education was given to the postoperative nursing staff via an in-person presentation during a monthly staff meeting. Those unable to attend the in-person presentation received an email with a Qualtrics link with a pre-test, voiceover PowerPoint presentation, and a post-test. Inventory control personnel were contacted before the education was provided to assess inventory and ordering frequency of Quease Ease inhalers and again after education was provided to assess changes in inventory and ordering frequency. To assess success, we compared pre-test and post-test scores as well as measured for increased usability of Quease Ease inhalers via inventory records.

Potential Barriers

Potential barriers to the results of this project include reluctance to participate in the data gathering by the hospital team members. Without sufficient responses from the pre-test and post-test there would not be substantial data gathered for this project. A chart review tracking the use of aromatherapy use would be ideal; however, aromatherapy does not have a designated place for charting. Additionally, aromatherapy is not a medication and tracking its use can be difficult to appropriately quantify with inventory control documentation.

Budget and Timeline

McLaren Flint currently has allocated funds toward obtaining and utilizing QueaseEase aromatherapy in their practice, thus, providing the benefit of not requiring allocation of funds to this quality improvement project. There is a potential for pharmacy funds to be increased or decreased depending on the findings of this project.

Evaluation Plan

Evaluation of the Results

Knowledge gained from educational PowerPoint presentation was evaluated to test our primary outcome of improving healthcare knowledge of aromatherapy and its use in the healthcare system. Following this presentation, measurement of Quease Ease inhaler inventory was conducted to assess the secondary outcome of increased usage of aromatherapy.

SPSS statistical software was utilized for compiling and evaluating data. A Wilcoxon signed-rank test was used to measure the knowledge acquisition after the educational portion of this project. Pre-test and post-test knowledge were measured with the difference in median scores. A Cronbach's Alpha test based on standardized items was performed for pre-test and post-test reliability. Subjective test questions utilized qualitative coding with weighted Kappa showing perfect interrater reliability. Descriptive statistics were utilized to evaluate subjective

data points from the pre-test and post-test. The specific knowledge objectives being analyzed via the pretest and posttest included:

- Significance and occurrence of PONV
- Adverse effects resulting from PONV
- Definition of aromatherapy
- Side effects of aromatherapy
- Contraindications of aromatherapy
- Cost-effectiveness

Refer to Appendix J for pretest and posttest.

Project Implementation

This quality improvement project was implemented on February 3, 2023, at McLaren Flint Hospital. A live presentation provided information regarding aromatherapy to PACU nurses and anesthesia staff. Before education, participants were instructed to fill out a pre-test to assess their baseline understanding of aromatherapy. Following this education, the participants were instructed to complete the post-test to assess the effectiveness of the presentation and if education changed any opinions of the use of aromatherapy. An email was drawn and sent to staff members who were not present for this live presentation. This email contained instructions to complete a Qualtrics module that included the same presentation including a pretest, video recorded presentation, and posttest. Following the live presentation, data was obtained involving the current ordering of Quease Ease aromatherapy inhaler devices. The number of devices ordered two months before the education will be recorded and compared to orders two months post-education. This was completed to attempt to measure the secondary outcome of whether education provided during the quality improvement project would affect usability of the product.

Results

Wilcoxon Signed-Rank Test

The pretest and posttest consisted of six knowledge-based questions regarding aromatherapy and postoperative nausea and vomiting. A Wilcoxon signed-rank test was used to compare pre-test assessment of knowledge and post-test assessment of knowledge. The results indicated a significant change in median location from pretest of 4 to a posttest of 6. That change between pretest knowledge (Mean = 3.8, SD = 1.06) showed a significant increase in posttest measured knowledge (Mean = 5.6, SD = .76), $Z = -4.16$, $P < .001$) (Appendix E: Figures 1 and 2). Cronbach's alpha was obtained (-.245) to show the deviation of the mean scores between the pre-test and post-test (Appendix E: Figure 3). This result indicates a difference between pre-test and post-test scores demonstrating increased knowledge regarding aromatherapy.

The pre-test and post-test contained 5-point Likert scale questions to assess attitudes toward the utilization of aromatherapy. When participants were asked how likely they would utilize aromatherapy as a first-line therapy to treat nausea in the hospital setting, there was an increase in mean scores from pretest (2.88) to posttest (3.84) with a Wilcoxon signed rank test ($p = .002$) (Appendix E: Figure 4).

Descriptive Statistics

The pretest possessed four subjective questions related to the attitudes the staff currently had toward aromatherapy usage. Two items were 5-point Likert scale questions and two were categorical style questions. The post-test questions included two open-ended questions and two Likert scale questions associated with the pretest questions. Cronbach's alpha was obtained to show the deviation of the mean scores between the pre-test and post-test. Wilcoxon signed rank

test showed significant improvement from pre-test to post-test after education (Appendix E: Figure 5).

Reliability Statistics

For the two open-ended questions, qualitative coding was used which divided answer choices into groups. Cohen's Weighted Kappa indicated perfect interrater reliability for categorizing answer choices as the interpretation of items 7-10 were strong/perfect between partners (Appendix E: Figures 6, 7, and 9). A Cronbach's Alpha test showed that the pre-test and post-test showed poor reliability as a measure of knowledge (Appendix E: Figure 8). A better tool is needed in future QI projects to improve reliability.

Discussion

Analysis of Objectives

Primary Objective. The primary objective of this project was to assess if education to the healthcare team regarding aromatherapy increased knowledge of this therapy to treat PONV and it was successful. Six knowledge-based questions were asked regarding contraindications, side effects, definitions, and statistics. There was a statistically significant improvement in the test's mean scores following aromatherapy education. An increase in these scores shows that the quality improvement project was successful in educating healthcare staff on the safe and efficacious use of aromatherapy.

Secondary Objective. A secondary outcome for this project involved assessment of the effect aromatherapy education had on the frequency of delivery of Quease Ease in the postoperative setting. To assess this, Quease Ease use was measured with the supply chain/inventory coordinator at McLaren Flint Hospital. Inventory was measured two months prior to education (December 3, 2022, to February 3, 2023) and two months post-education

(February 4, 2023, to April 3, 2023). The goal was that following education, there would be an increased use of the Quease Ease inhaler devices evidenced by an increase in product orders placed. However, the findings suggested that orders decreased following our education within an allotted two-month period. Eight boxes were ordered from December 3, 2022, to February 3, 2023, and 4 boxes were ordered from February 4, 2023, to April 3, 2023. A plethora of variables could have affected this decrease in product orders rather than the education provided from this quality improvement initiative alone.

Contradictory to these findings, a Likert scale question was asked how likely the provider would be to administer aromatherapy as a first line treatment to nausea over traditional antiemetic medications. The 5-point Likert scale question had the answer options of very unlikely (1), unlikely (2), neutral (3), likely (4), and very likely (5). There was a statistically significant change in the mean score of this attitude from pretest to posttest (2.88 to 3.84, $p = .002$). This increase means an overall attitude falling between unlikely and neutral changed towards neutral to likely. The attitude shifts successfully portrayed hopes that the quality improvement intervention would increase usage of aromatherapy for postoperative nausea and vomiting regardless of the decrease in product ordered.

Recommendations and Limitations

Recommendations

Recommendations for future quality improvement projects surrounding aromatherapy should involve education of multiple specialties that practice direct patient care. During the education process, multiple participants were unaware that aromatherapy was available at their facility. This claim was also solidified by responses on the posttest. Increasing awareness of all

potential treatments and therapies to the whole perioperative team including patients is imperative to treatment of nausea and prevention of vomiting.

Additionally, aromatherapy should have a designated place to be charted in any hospital's charting system. McLaren Flint Hospital did not have a section to chart aromatherapy use; thus, it is difficult to track usage and is a contributing factor that this therapy was an unknown option to staff. In the future, this issue can be corrected by working with the facility to develop a method of charting aromatherapy usage prior to initiating a quality improvement initiative. Once this is established, tracking the effectiveness and adherence to a quality improvement initiative would be easier to measure.

Limitations

This quality improvement project was conducted in person during a routine scheduled monthly meeting, however, only staff members that were scheduled for work were in attendance. This means that the sample of participants could have been larger than the final sample size of 25. A Qualtrics module was created to provide identical educational delivery as the in-person session; however, there was no participation via this virtual option.

A pre-test/post-test design was utilized to assess change in knowledge and attitudes of aromatherapy. These knowledge-based questions were created with current literature involving the use of aromatherapy, as cited throughout this paper. Attitude questions were created experimentally to assess the participant's thoughts of aromatherapy before and after education was provided. A more empirically proven pre-test/post-test design backed by literature and statistical significance should be utilized in the future.

To measure the use of Quease Ease aromatherapy inhaler devices, orders were tracked before and after the implementation of this quality improvement initiative as previously

described. This method to measure change in product use following education has potential confounding variables that may affect results. These variables include the number of surgical procedures performed, the number of at-risk patients for PONV, and the number of at-risk surgical procedures for PONV during the measured timeframe. Future quality improvement initiatives involving aromatherapy should have more concrete charting and recording of device usage by medical professionals. Additionally, patient surveys measuring subjective data of aromatherapy as a treatment option can be added to facilitate meaningful results.

Implications for Practice

Aromatherapy utilization has historically been regarded as a holistic Eastern therapy and less as a helpful adjunct to traditional Western medication. Nursing theories have traditionally focused on modern medications and treatments to provide optimal health care outcomes in practice; however, more focus needs to be placed on effective alternative treatment options. As a result, aromatherapy is not widely integrated into the healthcare field and needs to be regularly incorporated into formal nursing education. A paradigm shift is occurring throughout the nursing field as multimodal therapies are increasing in popularity and showing positive outcomes and increased patient satisfaction. Quality improvement projects such as this will be required to educate staff on multimodal and adjunct therapies to increase incorporation into practice.

This quality improvement project concluded that educating medical professionals on aromatherapy led to increased knowledge and an increased outlook on utilizing aromatherapy for treating postoperative nausea. If replicated on a larger scale, similar quality improvement projects may show similar results and potentially increase aromatherapy's safe and effective use in postoperative settings. Additionally, the adoption of aromatherapy into healthcare systems

may be increased due to education on literature discussing cost-effectiveness and federal funding options (Parra-Sanchez et al., 2012).

Contributions to the Doctor of Nursing Practice Essentials

The American Association of Colleges of Nurses (AACN) were responsible for construction of the Doctor of Nursing Practice Essentials that describe the educational competencies required of an advanced practice nurse. There are eight essentials in total that each student will achieve prior to graduation from a Doctor of Nurse Practice program. Throughout the course of this quality improvement initiative project the Doctor of Nursing Practice Essentials that were achieved include essentials II, III, IV, and VI.

Essential II: A quality improvement project was implemented at McLaren Flint Hospital. Education on aromatherapy was provided to the healthcare team via a live presentation with a PowerPoint visual. A pre-test/post-test design was utilized to assess an improved understanding of the topic.

Essential III: Critical appraisal of the literature was performed on aromatherapy's effect on PONV to gain a comprehensive review on this topic. Outcomes were assessed and the findings discussed in a comprehensive review. The relevance to the future of nursing practice was discussed and potential uses for this therapy presented.

Essential IV: Statistical data was obtained from studies collected from multiple online nursing databases. This data was evaluated for significance, compiled, compared, and contrasted between articles and relevant findings shared to express the impact of aromatherapy on patient outcomes in the field of nursing and anesthesia. Following implementation of this project, the use of SPSS statistical software was utilized to assess the data for statistical significance. The

information gathered from this data entry was utilized to disseminate results in the DNP project paper.

Essential VI: Collaboration with peers was performed to develop a project proposal and methodology implementing a quality improvement initiative surrounding aromatherapy in the postoperative setting. Health policy, standards of care, and confidentiality were considered when developing this initiative. As a professional team of two Oakland University DNP-NA students, an application was formulated and submitted to McLaren Flint Hospital to perform a quality improvement initiative project for utilization of aromatherapy to manage postoperative nausea and vomiting. This involved working closely with members of this health system to organize and develop a successful application for IRB approval.

Appendix A-Evaluation Table

Table A.

Author (date)	Study stated purpose	Subjects/setting	Research method/variables/measures	Results	Clinical Implication
Abril et al., 2019	The purpose of this pilot study was to assess the impact of inhaled peppermint essential oils on early postoperative nausea in female patients undergoing laparoscopic abdominal surgery.	35 English speaking women aged 18 and older undergoing laparoscopic abdominal surgery with general anesthesia in ambulatory surgical department and PACU in a community non-academic hospital in New York.	Patients must have been able to provide informed consent prior to participation. Color coded study forms were filled out by staff with all pertinent information during the perioperative process along with postoperative medical record reviews. Patient-reported postoperative nausea was recorded using the validated 4-point VAS (0=no nausea, 1=mild nausea, 2=moderate nausea, 3=severe nausea) upon arrival to and departure from the PACU, immediately before discharge home, and after surgery with a follow-up telephone call. If a VAS score of 1, 2, or 3 was recorded, participants inhaled peppermint oil through a plastic sniffer delivery system. Five minutes after the therapy, participants rated nausea again. If scores of 1, 2, or 3 were recorded, then patients were offered antiemetic medications.	All participants with reported nausea on arrival to the PACU (n =15) and using the aromatherapy sniffer reported a decrease in their nausea and 73% of these participants (n=11) had complete relief. 7 participants had nausea relief with aromatherapy without any antiemetic medications administered. 19 (54%) participants did not have any nausea upon arrival to the PACU.	Offering a choice of aromatherapy sniffers to patients after surgery has been shown to be correlated with reduction of nausea in this study. The authors suggest that aromatherapy can be used in addition to or to substitute antiemetic medications and these therapies may be an important advancement in patient-centered care. Continued research on aromatherapy may provide additional benefits in the future.
Briggs et al., 2016	Evaluate the usage of inhaled peppermint oil to manage postoperative nausea and vomiting in	This study took place in a large single center tertiary care facility in Delaware. The sample consisted of	This study was a quasi-experimental design with peppermint oil as the independent variable and nausea as the dependent variable. Patients were educated on how to utilize the inhaled peppermint oils	Average nausea rating before the intervention was 3.29. Two minutes after the intervention, the average nausea rating was 1.44.	According to the findings of this study, peppermint oil can be viable as an initial treatment for postoperative

	cardiac surgery patients. Secondary outcomes measured participant satisfaction with peppermint oil therapy to treat postoperative nausea and vomiting.	123 adult patients post cardiac surgery.	and used the inhalers if nausea occurred. Initial onset of nausea was recorded via a 0-5 (0 = no nausea, 5 = greatest nausea) PONV scale and then again after 2 minutes.	These ratings showed a statistically significant difference in nausea ratings utilizing paired t-tests.	nausea following cardiac surgery. Secondary outcomes concluded that the patients were satisfied with the essential oil therapy and were willing to utilize it again for future surgeries.
Brown et al., 2018	Examine the effectiveness of a blended aromatherapy patch on postoperative nausea and vomiting in a short-stay surgical facility.	50 patients enrolled. Male and female patients aged 18-80 years undergoing general anesthesia in a short-stay surgical center.	A quasi-experimental design with patients selecting a traditional antiemetic therapy or an essential oil patch. PONV was assessed upon arrival to the unit using the Ambulatory Surgery Index of Nausea, Vomiting, and Retching (AS-INRV), a 5-point Likert scale. 30 minutes after application of the patch, an additional AS-INVR score was obtained. If PONV remained an additional patch was provided, or a standard antiemetic was administered based on patient preference.	Of the 50 enrolled participants, 34% reported great, 30% moderate, 26% mild, 10% severe, and 48% no nausea before the administration of aromatherapy. Thirty-five (70%) of the participants reported improved nausea post intervention and 15 (30%) reported the same level of nausea after the intervention. No participants reported higher ratings of nausea after the intervention.	This quality improvement project involved a large at-risk population of PONV (women, non-smokers). However, results showed significant improvement of nausea scores. Thus, the administration of a blended aromatherapy was effective in reducing PONV for patients who undergo general anesthesia and should be utilized as an adjunct or option to these types of patients.
Fearrington et al., 2019	To determine if using essential oil products for	322 same day surgery patients were in this study. 179	Double blinded to the type of essential oil, subjects randomly chose a nasal inhaler of either	There was no statistically significant difference	This study demonstrated that patients receiving

	adult patients reduced the need for antiemetics for postoperative nausea and vomiting (PONV).	patients in the control group and 143 patients in the intervention group. This took place in a surgical center of a large urban teaching hospital.	peppermint, ginger, or a combination of both in the intervention group. Nausea was described using a 0 to 3 verbal descriptive scale. For any score 1 to 3, the subject was offered the nasal inhaler as first intervention. Nausea was then reassessed 5 minutes after inhaler use and the subject would be offered another dose if it was ineffective.	between the types of inhaler used. However, there was statistical significance via aromatherapy demonstrating a reduction in the need for antiemetic to treat PONV. The intervention group had a greater history of PONV but received fewer doses of antiemetics postoperatively compared with the control group.	aromatherapy had fewer antiemetics given. In addition, all three oils demonstrated a reduction in the need for antiemetics.
Ferruggiari et al., 2012	Assess the effect of aromatherapy on the severity of postoperative nausea (PON) in women undergoing surgical procedures in the post anesthesia care unit.	612 women gave informed consent. 71 reported nausea and vomiting. 23 participants in the aromatherapy group, 22 in the saline vapor group, and 25 in the traditional antiemetic group.	Quasi-experimental design. Aromatherapy was also compared with traditional antiemetics. Patients either received peppermint aroma vapor inhalation, a normal saline vapor inhalation, or Ondansetron.	Although after 10 minutes, the scores of postoperative nausea dropped the most in the peppermint group, the study did not achieve the 30 participants they needed for each group to become statistically significant. However, projections show that if they were to reach their confidence number that they would have been statistically significant.	Further investigation with a larger sample size is recommended to show statistical significance.
Hodge et al, 2014	To compare the effectiveness of aromatherapy (QueaseEase,	339 enrolled patients. 121 patients with postoperative nausea were	A prospective randomized two-group design was used with the treatment group receiving an aromatic inhaler and the control	Of 339 enrolled patients, 121 experienced PONV. 94 received an inhaler device,	The use of aromatherapy led to a high rate of satisfaction of patients with

	Soothing Scents, Inc, Enterprise, AL) versus an unscented inhalant in relieving PONV.	randomized into a treatment group and a control group. Conducted in a 250-bed military medical center in the Pacific Northwest. Patient population is adult surgical patients.	group receiving a placebo inhaler. QueaseEase was also used in this study for immediate treatment for nausea and was followed by prescribed antiemetic therapy if ineffective. Patients completed two 10-point Likert-type scales rating at baseline and after 3 minutes, as well as questionnaires addressing satisfaction with nausea treatment and perceived effectiveness of aromatherapy.	54 received the treatment inhaler and 40 received the placebo inhaler. Nausea scores in both the control and treatment group decreased significantly. Perceived effectiveness of aromatherapy was higher in the treatment group than the placebo group.	PONV. Aromatherapy was favorably received by most patients and represents an effective treatment option for postoperative nausea. A self-administering device like QE can oftentimes be delivered faster than it would take a nurse to deliver an antiemetic medication.
Karsten et al., 2020	To compare the incidence of PONV in patients receiving peppermint aromatherapy and usual care to patients receiving only usual care.	100 English speaking postoperative patients who were admitted to the PACU after surgery.	Quasi-experimental research design. A cotton ball with three drops of peppermint oil was waved in front of the patient's nose upon arrival to the PACU. Patients were then assessed for PONV for up to 1 hour in the PACU or until discharge, whichever occurred first. Patients rated their nausea on a 0 to 5 scale.	A total of 9 out of 50 patients became nauseated in the control group and 7 required antiemetics. 6 of the 60 patients in the peppermint group reported nausea and required antiemetics. 10% of the peppermint group became nauseated compared to the 14% who did not receive aromatherapy.	Although the data is not significant statistically, it suggests that peppermint aromatherapy may be a helpful adjunct treatment option for PONV.
Lane et al., 2012	The purpose of this study was to examine peppermint spirits effects on postoperative nausea and	This study was conducted in the women's center of community hospital within a large metropolitan city located in	A pretest-posttest research design was used for three different groups. These groups included peppermint group, placebo group, and standard antiemetic therapy (ondansetron or promethazine) control	There was no statistically significant difference in the three different groups baseline nausea scores. Two minutes after intervention	This study's findings support the effectiveness of peppermint aromatherapy in nauseated patients post C-section. The

	vomiting for scheduled C-Section patients.	the southeastern United States. Women that were English speaking, 18 years old, nonsmoker, and became nauseated post C-section were recruited for this study. A total of 35 participants became nauseated and participated.	group. Women were randomly assigned into these groups. When a patient became nauseated, their baseline nausea was measured using a 6-point nausea scale. They were then administered the appropriately grouped intervention and the 6-point nausea scale was used 2- and 5-minutes post-intervention.	showed statistically significant data that patients who received aromatherapy had lower nausea ratings than the other two groups. The same was shown for 5 minutes post-intervention.	use of aromatherapy as an adjunct medicine may also be of great use in this patient population.
Maghami et al., 2020	To examine the effect of peppermint essential oil inhalation on the postoperative nausea and vomiting after cardiac surgery.	60 cardiac surgery patients were divided into control and intervention groups in 2017.	Single-blind randomized clinical trial. The intervention group received an aromatherapy nebulizer with peppermint essential oil before the endotracheal tube was removed. Patient's nausea and vomiting were then assessed via a checklist.	The two groups were significantly different in terms of nausea frequency and severity. In terms of frequency, the control group was 2.31 times more frequently nauseated than the intervention group.	This study shows that aromatherapy could significantly decrease the frequency, duration, and severity of nausea and the frequency of vomiting in the first four hours after endotracheal tube removal in patients who underwent open-heart surgery.
Mcilvoy et al., 2015	To explore the effectiveness of the aromatherapy product QueaseEASE (QE) for decreasing post-discharge nausea (PDN) in patients	The sample included 70 outpatients who underwent abdominal surgery. Mean age 44 years, 53% female and 47% male.	Prospective and exploratory study. Patients with informed consent received QueaseEase (QE) which is an aromatherapy compound which combines the essential oils of peppermint, spearmint, lavender, and ginger in an enclosed delivery device. Measured using a Verbal Descriptive Scale (VDS) of 0 to 10.	45 of 70 participants (64%) reported no post-discharge nausea, where 25 participants (36%) reported an episode of post-discharge nausea.	This study found that the Aromatherapy QE was effective in treating post-discharge nausea in the same-day abdominal surgery patients. All patients that used the QE

	undergoing outpatient abdominal surgery. Design: Prospective exploratory study.		All episodes of antiemetic use were recorded, as well as all episodes of nausea occurring in Phase II PACU.		for nausea stated some sort of relief from the device.
Stallings-Welden et al., 2018	To determine effectiveness of aromatherapy compared with standard care for postoperative and postdischarge nausea and vomiting in ambulatory surgical patients.	The sample size of 254 ambulatory surgical patients in a 537-bed mid-west multicampus teaching hospital. Of the 254 participants, 221 were enrolled with 113 in the standard care group and 108 in the treatment group.	Subjects were assigned to a treatment arm at random via a sealed envelope that designated which treatment arm the patient will be allotted (standard care vs. aromatherapy group). Inclusion criteria consisted of ambulatory surgical patients that were discharged home after surgery. The standard care group received patient-specific pharmacologic administration to treat nausea symptoms. The aromatherapy group was treated with a 4-blend essential oil Quease EASE infuser including spearmint, peppermint, ginger, and lavender oils. Nausea levels were recorded upon arrival to the postoperative unit via a 5-point Likert scale and then again on and after complaints of nausea. Patients were contacted after discharge to assess subjective effectiveness of the therapies provided.	64 participants of the 221 experienced postoperative nausea/vomiting. Aromatherapy was 100% effective in treatment of postdischarge nausea and vomiting, while standard care was only 67% effective.	This study found no statistical significance between aromatherapy and standard care modalities. However, both groups had high satisfaction scores with their associated treatments. According to these researchers, aromatherapy is equally as effective in the treatment of nausea as standard care interventions.

Appendix B- IRB Approval



January 30, 2023

RE: IRB #: 2022-0061
REF #: 007196

Dear Nicole Wesley:

Thank you for the Request for Determination of Non-Human Subject Research for your project titled "Quality Improvement Project Utilizing Aromatherapy for the Treatment of Postoperative and Postdischarge Nausea and Vomiting." Based on the information you have provided, the MHC IRB has determined that this project **DOES NOT** qualify as human subject research as outlined in 45 CFR 46.102(d) and (f) or 21 CFR 56.102(c) and (e), and **is not subject to oversight by the MHC IRB.**

Although this project does not fall under the oversight of the MHC IRB, you still need to follow other institutional policies. **If your project involves access to medical records or PHI, you must contact your institutions' compliance / privacy officer.** It is also recommended that you consult with any departments that may be impacted by your project to ensure any departmental requirements are met.

Please be advised, it is your responsibility to consult with the IRB, in writing, if any changes are made in the project's current design, procedures, etc. Such changes may necessitate a new complete IRB submission.

If we can be of any further assistance or if you have any questions or concerns, please contact us at (248) 484-4950 or via e-mail at hrpp@mclaren.org.

Good luck with your project.

M. Ammar Hatahet, MD, MPH, FACP
McLaren Health Care IRB Chair

Appendix C- Aromatherapy Pre-test/Post-test

Pre-test

1. What percentage of post-surgical patients develop postoperative nausea/vomiting despite antiemetic medication administration?
 - a. 10%
 - b. 20%
 - c. 30%
 - d. 40%
2. What are negative side effects of PONV? (select 3)
 - a. Hemodynamic Instability
 - b. Aspiration pneumonia
 - c. Increased length of stay
 - d. Delayed wound healing
 - e. Dehydration/electrolyte imbalance
 - f. Sedation/Drowsiness
3. What is aromatherapy?
 - a. A medication derived from plant extracts used to treat nausea and vomiting
 - b. An FDA regulated therapy requiring a physician order to administer
 - c. The use of aromatic plant extracts or essential oils for therapeutic purposes
4. What is a negative side effect of aromatherapy?
 - a. QT prolongation
 - b. Sedation
 - c. Skin irritation/rash
 - d. Tachycardia
5. What is a contraindication to aromatherapy?
 - a. Heart Disease
 - b. True allergy
 - c. Asthma
 - d. There are no contraindications to aromatherapy
6. Aromatherapy is more/less cost effective compared to medications? (circle one)
7. Currently, what is your first line defense for postoperative nausea and vomiting?
 - a. Zofran
 - b. Reglan
 - c. Aromatherapy
 - d. Other
8. Previously, how have you utilized aromatherapy?
 - a. Stand-alone therapy
 - b. Adjunctive therapy alongside traditional antiemetic medications
 - c. Prophylactic therapy for patients at high risk for PONV
9. How likely are you to administer aromatherapy as a first line treatment to nausea over traditional antiemetic medications? (circle one)
 Very Unlikely Unlikely Neutral Likely Very Likely
10. In your experience, how effective has aromatherapy been for treating postoperative nausea? (circle one)
 Very Ineffective Ineffective Neutral Effective Very Effective

Post-test

1. What percentage of post-surgical patients develop postoperative nausea/vomiting despite antiemetic medication administration?
 - a. 10%
 - b. 20%
 - c. 30%
 - d. 40%
2. What are negative side effects of PONV? (select 3)
 - a. Hemodynamic Instability
 - b. Aspiration pneumonia
 - c. Increased length of stay
 - d. Delayed wound healing
 - e. Dehydration/electrolyte imbalance
 - f. Sedation/Drowsiness
3. What is aromatherapy?
 - a. A medication derived from plant extracts used to treat nausea and vomiting
 - b. An FDA regulated therapy requiring a physician order to administer
 - c. The use of aromatic plant extracts or essential oils for therapeutic purposes
4. What is a negative side effect of aromatherapy?
 - a. QT prolongation
 - b. Sedation
 - c. Skin irritation/rash
 - d. Tachycardia
5. What is a contraindication to aromatherapy?
 - a. Heart Disease
 - b. True allergy
 - c. Asthma
 - d. There are no contraindications to aromatherapy
6. Aromatherapy is more/less cost-effective compared to medications? (circle one)
7. After this presentation, how likely are you to administer aromatherapy as a first line treatment to nausea over traditional antiemetic medications? (circle one)
 Very Unlikely Unlikely Neutral Likely Very Likely
8. Are there any barriers to you utilizing aromatherapy in your practice at your current place of employment? (fill in the blank)
9. After this presentation, which method of aromatherapy utilization do you believe would be best?
 - a. Stand-alone therapy
 - b. Adjunctive therapy alongside traditional antiemetic medications
 - c. Prophylactic therapy for patients at high risk for PONV
10. Please share any positive or negative thoughts or experiences you have towards aromatherapy.

Appendix D- Data Collection Tool

Data for Quality Improvement Project									
Objective Pre-Test Questions					Objective Post-Test Questions				
Pre-Test Question Number	Individuals with Correct Answer	Total Number of Participants	Post-Test Question Number	Individuals with Correct Answer	Total Number of Participants				
1	13	25	1	23	25				
2	11	25	2	19	25				
3	17	25	3	21	25				
4	21	25	4	24	25				
5	13	25	5	23	25				
6	17	25	6	22	25				
Subjective Pre-Test Questions									
Pre-Test Question Number	Individuals Responses								
7	a. 22 b. 0 c. 3 d. 0								
8	a. 2 b. 20 c. 2 no response. 2 Very unlikely. 5 unlikely. 5 neutral. 6 Likely. 6 Very likely. 3								
9	Very ineffective- 0 Ineffective Neutral-12 Effective- 13 Very Effective- 0								
10									
Subjective Post-Test Questions									
Post-Test Question Number	Individuals Responses								
7	Very unlikely- 1 unlikely- 2 neutral- 4 likely-11 very likely- 7 no barriers- 7 Education needed no aromatherapy access for anesthesia knowledge of product availability -3 "do we have this here?"								
8	a-2 b- 20 c-3								
9	used at other facility and it worked great positive that no order is needed unfamiliar sounds awesome good idea to use aromatherapy								
10	DOM POSITIVE 8 NEGATIVE 8 KYLE POSITIVE 8 NEGATIVE 1								

Appendix E- Data Tables

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum	25th	Percentiles 50th (Median)	75th
Pretest	25	3.8400	1.06771	2.00	6.00	3.0000	4.0000	5.0000
Post_test	25	5.6000	.76376	3.00	6.00	5.0000	6.0000	6.0000

Figure 1

Test Statistics^a

	Post_test - Pretest
Z	-4.161 ^b
Asymp. Sig. (2-tailed)	<.001

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

Figure 2

Reliability Statistics

Cronbach's Alpha ^a	Cronbach's Alpha Based on Standardized Items ^a	N of Items
-.232	-.245	6

a. The value is negative due to a negative average covariance among items. This violates reliability model assumptions. You may want to check item codings.

Figure 3

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum	25th	Percentiles 50th (Median)	75th
Q9-pre	25	2.88	1.333	1	5	2.00	3.00	4.00
Q7	25	3.84	1.068	1	5	3.00	4.00	5.00

Figure 4

Test Statistics^a

	Q7 - Q9-pre
Z	-3.035 ^b
Asymp. Sig. (2-tailed)	.002

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

Figure 5

Descriptives			Statistic	Std. Error
Q7-pre	Mean		1.26	.144
	95% Confidence Interval for Mean	Lower Bound	.96	
		Upper Bound	1.56	
	5% Trimmed Mean		1.18	
	Median		1.00	
	Variance		.474	
	Std. Deviation		.689	
	Minimum		1	
	Maximum		3	
	Range		2	
	Interquartile Range		0	
	Skewness		2.351	.481
	Kurtosis		3.855	.935
Q8-pre	Mean		2.00	.089
	95% Confidence Interval for Mean	Lower Bound	1.82	
		Upper Bound	2.18	
	5% Trimmed Mean		2.00	
	Median		2.00	
	Variance		.182	
	Std. Deviation		.426	
	Minimum		1	
	Maximum		3	
	Range		2	
	Interquartile Range		0	
	Skewness		.000	.481
	Kurtosis		3.771	.935
Q9-pre	Mean		2.74	.268
	95% Confidence Interval for Mean	Lower Bound	2.18	
		Upper Bound	3.30	
	5% Trimmed Mean		2.71	
	Median		3.00	
	Variance		1.656	
	Std. Deviation		1.287	
	Minimum		1	
	Maximum		5	
	Range		4	
	Interquartile Range		2	
	Skewness		.115	.481
	Kurtosis		-1.014	.935
Q10-pre	Mean		3.48	.106
	95% Confidence Interval for Mean	Lower Bound	3.26	
		Upper Bound	3.70	
	5% Trimmed Mean		3.48	
	Median		3.00	
	Variance		.261	
	Std. Deviation		.511	
	Minimum		3	
	Maximum		4	
	Range		1	
	Interquartile Range		1	
	Skewness		.093	.481
	Kurtosis		-2.190	.935

Figure 6

Descriptives			Statistic	Std. Error
Q7	Mean		3.84	.214
	95% Confidence Interval for Mean	Lower Bound	3.40	
		Upper Bound	4.28	
	5% Trimmed Mean		3.92	
	Median		4.00	
	Variance		1.140	
	Std. Deviation		1.068	
	Minimum		1	
	Maximum		5	
	Range		4	
	Interquartile Range		2	
	Skewness		-.996	.464
	Kurtosis		.813	.902
Q8	Mean		1.20	.216
	95% Confidence Interval for Mean	Lower Bound	.75	
		Upper Bound	1.65	
	5% Trimmed Mean		1.17	
	Median		1.00	
	Variance		1.167	
	Std. Deviation		1.080	
	Minimum		0	
	Maximum		3	
	Range		3	
	Interquartile Range		2	
	Skewness		.647	.464
	Kurtosis		-.747	.902
Q9	Mean		2.04	.091
	95% Confidence Interval for Mean	Lower Bound	1.85	
		Upper Bound	2.23	
	5% Trimmed Mean		2.04	
	Median		2.00	
	Variance		.207	
	Std. Deviation		.455	
	Minimum		1	
	Maximum		3	
	Range		2	
	Interquartile Range		0	
	Skewness		.194	.464
	Kurtosis		2.710	.902
Q10	Mean		.40	.115
	95% Confidence Interval for Mean	Lower Bound	.16	
		Upper Bound	.64	
	5% Trimmed Mean		.34	
	Median		.00	
	Variance		.333	
	Std. Deviation		.577	
	Minimum		0	
	Maximum		2	
	Range		2	
	Interquartile Range		1	
	Skewness		1.130	.464
	Kurtosis		.439	.902

Figure 7

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.495	.451	4

Figure 8

Cohen's Weighted Kappa						
Ratings	Weighted Kappa ^a	Asymptotic			95% Asymptotic Confidence Interval	
		Std. Error ^b	z ^c	Sig.	Lower Bound	Upper Bound
Q8a - Q8	1.000	.000	6.892	<.001	1.000	1.000
Q8a - Q10	.169	.095	1.857	.063	-.018	.356
Q8a - Q10A	.169	.095	1.857	.063	-.018	.356
Q8 - Q10	.169	.095	1.857	.063	-.018	.356
Q8 - Q10A	.169	.095	1.857	.063	-.018	.356
Q10 - Q10A	1.000	.000	5.686	<.001	1.000	1.000

a. The estimation of the weighted kappa uses linear weights.

b. Value does not depend on either null or alternative hypotheses.

c. Estimates the asymptotic standard error assuming the null hypothesis that weighted kappa is zero.

Figure 9

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