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An Educational Module Explaining the Analgesic Efficacy of The PEC Block For a Radical Mastectomy: A Quality Improvement Project

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An Educational Module Explaining the Analgesic Efficacy of The PEC Block For a Radical
Mastectomy: A Quality Improvement Project

A DNP Project Presented to the Faculty of the
Nicole Wertheim College of Nursing and Health Sciences

Florida International University

In partial fulfillment of the requirements
For the Degree of Doctor of Nursing Practice

By

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ABSTRACT

Background: The use of regional anesthesia in combination with general anesthesia for patients undergoing radical mastectomy has shown to be efficacious anesthetic technique at reducing pain postoperatively. Prior to the discovery of the PEC 2 block in 2011, the common regional techniques for radical mastectomy consisted of a thoracic paravertebral block (TPVB) or Erector Spinae Plane Block (ESPB). The PEC 2 block is two separate injections of local anesthetic with the first injection between the pectoralis major muscle and the pectoralis minor muscle, and the second injection between the pectoralis minor and the serratus anterior muscle. Recent studies have aimed to evaluate the analgesic efficacy of the PEC block in comparison to the TPVB and ESPB in Radical Mastectomy Procedures. The research suggests that the PEC block provides superior analgesic efficacy with the radical mastectomy in comparison to the TPVB and ESPB.

Methods: A concise search strategy was implemented to identify suitable randomized clinical trials (RCTs) and meta-analysis reviews (MARs) using CINAHL, PUBMED, and FIU's library database. All RTCs and MARs comparing the analgesic efficacy PEC block and either the TPVB or ESPB in combination with general anesthesia for patients undergoing a radical mastectomy or modified radical mastectomy.

Results: Amongst the total number of participants in the educational intervention (n=4), all participants demonstrated improved knowledge on the analgesic efficacy of the PEC block for radical mastectomy procedure. All four participants expressed increased willingness to implement the PEC block for radical mastectomy in combination with general anesthesia.

KEYWORDS: *Pectoralis Nerve block, PEC Block, Mastectomy, Breast Removal Surgery.*

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INTRODUCTION

Problem Identification

Breast cancer is a prominent type of cancer in the female population worldwide. Currently, the primary treatment for breast cancer is a mastectomy which is the removal of breast tissue. There are several variations of mastectomy procedures, including modified mastectomy and total mastectomy. The project's primary focus is on radical mastectomy, which involves removing the breast tissue, the underlying pectoral muscle, and the axilla lymph nodes. A radical mastectomy often accompanies acute pain and is often severe for many women within the first 24 hours after surgery. If inadequately treated, severe acute pain can produce poor patient outcomes such as delayed recovery and chronic pain.

Anesthesia providers often utilize opioid analgesics to reduce pain associated with surgical stimuli. Although proven to be very effective for treating acute pain, the side effects of opioids can be more detrimental to the patient than acute pain. The three primary drawbacks of using opioids intraoperatively and postoperatively for mastectomy procedures include the opioid abuse potential, postoperative nausea and vomiting, and potentiating breast cancer spread.¹ Due to these reasons, the anesthesia community has studied different anesthetic techniques to limit or remove the use of opioids perioperatively. However, given the severity of pain associated with radical mastectomies and the multitude of muscles and nerves involved with a radical mastectomy, many anesthesia providers use several anesthetic techniques to provide opioid-free and opioid-sparing anesthesia.

Background

The use of regional anesthesia is an often-utilized technique that has shown to be effective at limiting and preventing opioids for several surgical procedures, either as the sole

anesthetic technique or in conjunction with general anesthesia and moderate sedation. As mentioned earlier, the severity of pain associated with a radical mastectomy and the various muscles and nerves involved with the surgery make adequate analgesia through regional anesthesia alone challenging to accomplish. However, robust research evidence has shown that regional anesthesia in conjunction with general anesthesia has decreased breakthrough opioid use in the first 24 hours post-op, prolonged the first request for opioids, and reduced PONV.^{2,3}

Before 2011 the thoracic paravertebral was the predominant regional anesthetic technique for intraoperative analgesia involving mastectomy procedures. However, in 2011 Bianco introduced the PEC 1 block, and later in 2012, the PEC 2 block as a novel regional anesthetic technique for analgesia for surgical procedures involving the breast. The PEC 1 block is performed by injecting local anesthetic between the pectoralis major and the pectoralis minor at the 3rd rib aiming for the lateral and median pectoral nerves.⁵ The PECS 2 consists of two separate injections, with the first being the same as the PEC 1 block. However, the second injection of the local anesthetic block is injected between the pectoralis minor and the serratus anterior at the 4th rib aiming for the lateral branches of the intercostal nerves that exit at the level of the mid-axillary line.⁵

Scope of the Problem

In the United States, breast cancer is one of the most common types of cancer seen in women. Over 250,000 women are diagnosed with breast cancer yearly.¹ The most prominent treatment to combat breast cancer is a surgical intervention known as a mastectomy, with over 100,000 mastectomy procedures performed nationally.¹ One of the most problematic complications associated with mastectomies is postoperative pain. Surgeries involving the breast have been shown to cause severe postoperative pain in over 50% of patients and estimated 25%

to 50% of the patients often suffer from pain for several weeks to months following surgery.¹ Inadequate postoperative management of pain can be detrimental to the patient, often producing poor surgical outcomes. Recent studies have shown strong correlations between moderate and severe postoperative acute pain and the progression of chronic pain. Specific to mastectomy, a recent meta-analysis of 30 studies involving 19,813 patients correlated a one-point increase in the 0-10 pain scale increased the likelihood of the patient developing Post Procedure Mastectomy Pain (PPMP).¹

Consequences of the problem

Since the turn of the century, American consumption of opioids and the associated complications has become a national crisis. Due to the medical community's role in contributing to the crisis through over-prescribing opioid and their role in attenuating the crisis, prescription opioid use has become one of the most popular medical topics researched today. Anesthesia plays a vital role in attenuating the opioid crisis by performing alternative anesthetic techniques and pharmacological agents to reduce the use of opioids to treat analgesia perioperatively. Recent studies suggest that minor and major surgeries can increase the chances of requiring chronic opioid use.⁷

Before the new evidence emerging with opioid's impact on metastasis of breast cancer, opioids to manage perioperative pain were frequently used in mastectomy procedures; with the emergence of this correlation, large amounts of opioids to manage pain for mastectomies are under scrutiny. Several studies revealed correlations between opioids and tumor progression. Current literature on opioids and their mechanism to potentiate tumor progression remains under investigation. However, the current research has revealed that opioids stimulate mast cell

activation and increase substance P and cytokines concentrations.⁸ Opioids may also directly enhance cancer cell growth by interacting with the surface of certain cancer cell lines.⁹

Knowledge Gaps

The promising results of PEC blocks in mastectomy and other related surgical procedures at providing analgesia and limiting opioid usage have caused the technique to increase in popularity. However, its use in practice remains an underutilized anesthetic technique in practice. Currently, the research is limited on why pec blocks are not more commonly performed with mastectomies. Due to its novelty, knowledge, and confidence of the PEC block varies in the anesthesia community. Another limitation to using pec blocks is the variability in the provider's proficiency at performing the technique. The use of ultrasound knowledge and skill varies greatly among anesthesia providers and is required to perform the block safely. Several elements of the pec block are currently being explored. Lastly, their elements include different dose ranges, local anesthetics, and combining other pharmacological medications with the local anesthetic to enhance the analgesic effects.

Solution to the Problem

This DNP project aims to improve the anesthesia providers' knowledge of PEC blocks in combination with general anesthesia for mastectomy procedures. Strong evidence from several studies that pec blocks for mastectomy decrease opioid requirements intraoperatively, significantly delay the onset of patient's need for opioids postoperatively and decreases the number of opioids required to manage acute pain within the first 24 hours decreases postoperative nausea and vomiting.^{2,3,4} The goal of the DNP project is to increase the use of pec blocks for mastectomies by enhancing the provider's knowledge of the most current research on the topic while also enhancing their proficiency on the technique.

Purpose

PICO Question or Purpose

Population (P): Anesthesia providers

Intervention (I): Improve knowledge on the PEC 2 block for modified radical mastectomy

Comparison (C): Thoracic Paravertebral block and Erector Spinae Plane Block

Outcomes (O): acute postoperative analgesia

Summary of the Literature

The Modified Radical Mastectomy is a painful surgical procedure that often requires analgesics postoperatively. Although opioids are effective analgesics at treating pain postoperatively, they are also associated with unwanted and detrimental effects. As mentioned previously, opioids are associated with delayed recovery, dependence and misuse, and are linked to potential metastasis due to immune system suppression and NK cells. Prior to the discovery of the pectoral nerve block, the TPVB and ESPB were standard regional anesthetic techniques utilized in conjunction with general anesthesia to provide analgesia for MRM patients.

In the three studies in the literature review evaluating the analgesic efficacy of the PEC block in comparison to TPVB in patients undergoing MRM, two of the studies concluded greater analgesic efficacy and duration with PEC blocks in comparison to TPVB. The studies also found that TPVB performed poorly in providing analgesia to the axilla region. The third study found no significant difference in the analgesic efficacy between the two different blocks. However, the third study did conclude a greater rate of complication with TPVB in comparison to the PEC block.

The two other studies included in the literature review analyzed the analgesic efficacy and duration of the PEC block in comparison to the ESPB in MRM procedures. Both studies concluded superior analgesic efficacy by measuring total postoperative opioid consumption within the first 24 hours and lower pain scores at several time intervals. The results of the two studies produced similar results analgesic duration of each block. The studies found significantly longer durations in the first request of analgesics in patients who received a PEC block instead of ESPB.

The pectoral nerve block proves to be an efficacious analgesic option for anesthesia providers in conjunction with general anesthesia for patients undergoing modified radical mastectomies. However, they remain underutilized by the anesthesia community. One of the principal reasons for their limited use is the lack of knowledge and variability in the provider's experience performing the PEC block. First introduced in 2011, the PEC block is a relatively new regional technique with opportunities for further exploration. Further research is required on the PECB's effect on PMPS and chronic pain. Another area of further research is the addition of different pharmacological agents in conjunction with local anesthetics to enhance and increase the duration of analgesia.

Methodology

Eligibility Criteria

The studies selected for evaluation of the literature review were based on inclusion and exclusion criteria that most closely aligned with the objectives. Requirements for the inclusion criteria included studies published from 2016-2021, in the English language, with full-text availability. The final inclusion parameter was level 1 strength of evidence based on the John Hopkins Nursing Evidence-Based Practices Strength of Evidence Rating Scheme. Database

sources were accessed through the Florida International University library. The following keywords were selected concerning the clinical questions using Boolean operators: Pectoralis Nerve block, PEC Block, Mastectomy, Breast Removal Surgery.

Information Sources

The databases used for the literature search were Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed, and Medline (ProQuest).

Search Strategy

The search initially yielded 130 total results, 67 from PubMed, eight from Medline (Proquest), and six from CINAHL. Studies that were not published within the last five years were excluded from the literature review. The initial results were imported into the citation database and reviewed for duplicates, where nine studies were removed. The 55 remaining titles were analyzed to correlate to the clinical question; thirteen studies were further subjected to a full abstract review. After reviewing the abstracts, five studies were included in the literature review based on the level of evidence and the correlation to the clinical question.

Results

Study Characteristics

A total of five studies were included in the literature review. The studies selected were based on evidence and the similarity of the objectives between the study and the literature review. Of the five studies, three of the studies compared the analgesic efficacy between the PEC block and the thoracic paravertebral block. Two studies evaluated the analgesic efficacy of the PEC block in comparison to the Erector Spinae Plane block.

Kulhari et al., 2016 evaluated the analgesic efficacy of the PEC block in comparison to the thoracic paravertebral block in patients undergoing a radical mastectomy. Both blocks were compared using a PCA pump postoperatively to evaluate the total consumption of morphine in 24 hours and the duration until the PCA pump was first used. A Visual Analog score was used to assess the Patient's pain. The vital signs and pain scores were evaluated at the were evaluated t 0, 0.5, 1, 2, 4, 6-, 8-, 12-, and 24-hour mark following the surgery. The study included 40 adult women undergoing radical mastectomy, randomly and evenly divided into two groups: a thoracic paravertebral block group and a PEC block group. Both groups underwent general anesthesia 30 minutes following the placement of the randomly assigned group. The consistent variables between both groups included age, height, weight, ASA status, and duration of surgery.

The study results revealed significantly prolonged analgesia in the pec block group compared to the thoracic paravertebral block with the mean first request at 197.5 minutes and 294.5 minutes, respectively.⁶ The total 24-hour morphine consumption was also significantly less in the PEC block group, with mean total morphine of 3.90 mg compared to 5.30 in the TPVB group.⁶ The VAS was less in the PEC group at the 0–2-hour mark and equal after that. The study also revealed that the PEC group had more profound analgesia to the axillary area, whereas the TPVB was ineffective. Limitations of the study included small sample size, lack of heterogenicity, and unblinded patients.

Hamed et al., 2019 performed a similar study evaluating the analgesic efficacy of the PEC block versus TPVB in MRM. The secondary objective was the duration required to perform each block. The study was performed on 30 adult females randomly divided into two groups comprising 15 patients in each group. All subjects had the regional block performed before general anesthesia. The objectives were measured by evaluating the total analgesic consumption

for the first 24-hour period, the first request of rescue analgesia and vital signs and pain score will be recorded at 0, 1, 2, 4, 6, 8, 12, 18, and 24 h after surgery.

The study results revealed lower systolic blood pressure immediately following the procedure in the PEC group compared to the TPVB.⁷ This study also showed that patients in the PECS group had a significantly longer duration of postoperative analgesia and required less postoperative pethidine consumption in the first 24 hours, had lower VAS scores in the first four hours, and had decreased hemodynamic changes in comparison with PVB.⁷ Limitations to the study included a lack of heterogenicity as well as a small sample size.

In the third study, Martinev et al., (2020), evaluated the analgesic efficacy of PEC block compared to TPVB for MRM. Secondary objectives of the study included the duration required to perform each regional technique and complications associated with each technique. The study included 60 adult women with ASA status of one or two undergoing unilateral MRM. The patients were randomly divided into equal groups and underwent the regional technique allocated to their group prior to general anesthesia. There were no statistically significant differences in age, weight, and duration of surgery between the PEC group and TPVB.

The objective of the study was to measure by analyzing the total ketoprofen and promedol in the first 24 hours following surgery, the duration until patients requested pain medication, and NRS at 0, 1, 2, 4, 6, 8, 12, 18, and 24 h after surgery.⁸ The study concluded that there was no significant statistical difference between the two regional approaches in analgesic duration and efficacy. However, the TPVB was associated with a higher rate of complications compared to the PEC block.⁸ The main limitation of the study was a lack of heterogeneity and small sample size.

Sinha et al., (2019) Performed a single-blind prospective study evaluating the analgesic efficacy and adverse effects of A PEC block compared to an ESP block in patients undergoing modified radical mastectomy.⁹ The two regional anesthetic techniques were compared by evaluating the morphine consumption in the first 24 hours postoperatively. Secondary objectives included analgesic duration, sensory blockade, postoperative pain scores, and adverse effects. Sixty-four total subjects of the female gender aged 18-64 years old with ASA class of one or two undergoing MRM in 15 months were included in the study.

The 64 subjects were randomly and evenly divided into a PEC block group and an ESPB group. The regional techniques were performed before the procedure and then underwent general anesthesia. All patients received Patient controlled Analgesia (PCA) pumps with only bolus 1-2mg of morphine available for postoperative analgesia with allowed an evaluation of total morphine consumption in 24 hours and the first request of rescue analgesia. NRS pain scales were also performed on the patients hourly and monitored to assess for adverse events (hypotension and respiratory distress).

The study results revealed a statistically significant difference in the total morphine consumption over 24 hours and the duration of analgesia between the groups. The mean requirement of morphine over 24 hours for the PEC group was 0.94mg compared to 1.35 mg in the ESP group.⁹ The mean duration of analgesia in the PEC group was 7.26 hours, whereas the ESP group was 5.87.¹⁰ The NRS pain scales among the PEC group were also significantly lower than the ESP group at every interval except the 8- and 12-hour mark.⁹ Limitations to the study included small sample size, assessment of chronic pain for the two types of blocks, and the patients not being blinded.

In a prospective, single-blind study performed by Altiparmek et al., (2019), the analgesic efficacy of PECS block was compared to ESP block for patients undergoing MRM. The study included 38 adult females aged 18-45 years old with ASA scores of one and two. The study's primary objectives were to compare the effects of PECS block and ESP block on postoperative opioid consumption of patients undergoing unilateral modified radical mastectomy surgery with axillary lymph node dissection. As well as a secondary objective to compare the intraoperative fentanyl use between the two groups.

The study was performed by dividing the subjects into two random groups 18 in the ESP block group and 20 in the PEC block group. The patients underwent general anesthesia and then were randomly assigned to one of the two groups, and the assigned block was performed. The patients' total tramadol consumption measured the postoperative analgesic efficacy of the two blocks over 24 hours and the NRS pain scores at intervals of 15, 30, 60, and 120 minutes and at the 12- and 24-hour mark.

Upon conclusion of the study, the results revealed a significantly higher consumption of tramadol in the first 24 hours postoperatively in the ESP group compared to the PEC group. Other than at the 15- and 30-minute marks postoperatively, where both groups showed no differentiation, mean NRS scores were significantly lower in the PEC group compared to the ESPB group.¹⁰ Intraoperative fentanyl consumption showed no significant difference between the groups. The primary limitation of the study was the absence of sensory blockade evaluation before surgery.¹⁰ This was because both blocks were performed after general anesthesia induction. However, conducting the study in this manner did allow for blinding of the patients and the anesthesia providers performing the blocks. The study also acknowledged a limitation in

patients undergoing the ESP block. Patients who underwent an ESP block may have been aware that they received the ESP block because of injection site pain in the back.¹⁰

Table 1: Literature Review

Author(s)	Purpose	Methodology/ Research Design	Intervention(s)/ Measures	Sampling/Setting	Primary Results
Kulhari et al.,	evaluated the analgesic efficacy of the PEC block in comparison to the thoracic paravertebral block in patients undergoing a radical mastectomy	Randomized Clinical Trial (RCT) Level 1	Both blocks were compared using a PCA pump postoperatively to evaluate the total consumption of morphine in 24 hours and the duration until the PCA pump was first used. A Visual Analog score was used to assess the Patient's pain. The vital signs and pain scores were evaluated at the were evaluated t 0, 0.5, 1, 2, 4, 6-, 8-, 12-, and 24-hour mark following the surgery.	The study included 40 adult women undergoing radical mastectomy, randomly and evenly divided into two groups: a thoracic paravertebral block group and a PEC block group. Both groups underwent general anesthesia 30 minutes following the placement of the randomly assigned group. The consistent variables between both groups included age, height, weight, ASA status, and duration of surgery.	The study results revealed significantly prolonged analgesia in the pec block group compared to the thoracic paravertebral block with the mean first request at 197.5 minutes and 294.5 minutes, respectively.6 The total 24-hour morphine consumption was also significantly less in the PEC block group, with mean total morphine of 3.90 mg compared to 5.30 in the TPVB group.6 The VAS was less in the PEC group at the 0–2-hour mark and equal after that.
Hamed et al.,	evaluating the analgesic efficacy of the PEC block versus TPVB in MRM.	Randomized Clinical Trial (RCT) Level 1	The objectives were measured by evaluating the total analgesic consumption for the first 24-hour period, the first request of rescue analgesia and vital signs and pain score will be recorded at 0, 1, 2, 4, 6, 8, 12, 18, and 24 h after surgery.	The study was performed on 30 adult females randomly divided into two groups comprising 15 patients in each group. All subjects had the regional block performed before general anesthesia.	The study results revealed lower systolic blood pressure immediately following the procedure in the PEC group compared to the TPVB.7 This study also showed that patients in the PECS group had a significantly longer duration of postoperative analgesia and required less postoperative pethidine consumption in the first 24 hours, had lower VAS scores in the first four hours, and had

					decreased hemodynamic changes in comparison with PVB. 7
Martinev et al.,	evaluated the analgesic efficacy of PEC block compared to TPVB for MRM. Secondary objectives of the study included the duration required to perform each regional technique and complications associated with each technique	Randomized Clinical Trial (RCT) Level 1	The objective of the study was to measured by analyzing the total ketoprofen and promedol in the first 24 hours following surgery, the duration until patients requested pain medication, and NRS at 0, 1, 2, 4, 6, 8, 12, 18, and 24 h after surgery.8	The study included 60 adult women with ASA status of one or two undergoing unilateral MRM. The patients were randomly divided into equal groups and underwent the regional technique allocated to their group prior to general anesthesia. There were no statistically significant differences in age, weight, and duration of surgery between the PEC group and TPVB.	The study concluded that there was no significant statistical difference between the two regional approaches in analgesic duration and efficacy. However, the TPVB was associated with a higher rate of complications compared to the PEC block.8
Sinha et al.,	Performed a single-blind prospective study evaluating the analgesic efficacy and adverse effects of A PEC block compared to an ESP block in patients undergoing	Randomized Clinical Trial (RCT) Level 1	The two regional anesthetic techniques were compared by evaluating the morphine consumption in the first 24 hours postoperatively. Secondary objectives included analgesic duration, sensory blockade, postoperative pain scores, and adverse effects.	Sixty-four total subjects of the female gender aged 18-64 years old with ASA class of one or two undergoing MRM in 15 months were included in the study. The 64 subjects were randomly and evenly divided into a PEC block group and an ESPB group. The regional techniques were performed before the procedure and then	The study results revealed a statistically significant difference in the total morphine consumption over 24 hours and the duration of analgesia between the groups. The mean requirement of morphine over 24 hours for the PEC group was 0.94mg compared to 1.35 mg in the ESP group.9 The mean duration of analgesia in the PEC group was 7.26 hours, whereas the ESP group was 5.87.10 The NRS pain scales among the PEC group were also significantly

	modified radical mastectomy. ⁹			underwent general anesthesia. All patients received Patient controlled Analgesia (PCA) pumps with only bolus 1-2mg of morphine available for postoperative analgesia with allowed an evaluation of total morphine consumption in 24 hours and the first request of rescue analgesia. NRS pain scales were also performed on the patients hourly and monitored to assess for adverse events (hypotension and respiratory distress).	lower than the ESP group at every interval except the 8- and 12-hour mark. ⁹
Altiparmek et al.,	the analgesic efficacy of PECS block was compared to ESP block for patients undergoing MRM.	Randomized Clinical Trial (RCT) Level 1	The study was performed by dividing the subjects into two random groups 18 in the ESP block group and 20 in the PEC block group. The patients underwent general anesthesia and then were randomly assigned to one of the two groups, and the assigned block was performed. The patients' total tramadol consumption measured the postoperative	The study included 38 adult females aged 18-45 years old with ASA scores of one and two	Upon conclusion of the study, the results revealed a significantly higher consumption of tramadol in the first 24 hours postoperatively in the ESP group compared to the PEC group. Other than at the 15- and 30-minute marks postoperatively, where both groups showed no differentiation, mean NRS scores were significantly lower in the PEC group compared to the ESPB group. ¹¹ Intraoperative fentanyl consumption showed no

			analgesic efficacy of the two blocks over 24 hours and the NRS pain scores at intervals of 15, 30, 60, and 120 minutes and at the 12- and 24-hour mark.		significant difference between the groups.
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Discussion

The Modified Radical Mastectomy is a painful surgical procedure that often requires analgesics postoperatively. Although opioids are effective analgesics at treating pain postoperatively, they are also associated with unwanted and detrimental effects. As mentioned previously, opioids are associated with delayed recovery, dependence and misuse, and are linked to potential metastasis due to immune system suppression and NK cells. Prior to the discovery of the pectoral nerve block, the TPVB and ESPB were standard regional anesthetic techniques utilized in conjunction with general anesthesia to provide analgesia for MRM patients.

In the three studies in the literature review evaluating the analgesic efficacy of the PEC block in comparison to TPVB in patients undergoing MRM, two of the studies concluded greater analgesic efficacy and duration with PEC blocks in comparison to TPVB. The studies also found that TPVB performed poorly in providing analgesia to the axilla region. The third study found no significant difference in the analgesic efficacy between the two different blocks. However, the third study did conclude a greater rate of complication with TPVB in comparison to the PEC block.

The two other studies included in the literature review analyzed the analgesic efficacy and duration of the PEC block in comparison to the ESPB in MRM procedures. Both studies concluded superior analgesic efficacy by measuring total postoperative opioid consumption within the first 24 hours and lower pain scores at several time intervals. The results of the two studies produced similar results analgesic duration of each block. The studies found significantly longer durations in the first request of analgesics in patients who received a PEC block instead of ESPB.

The pectoral nerve block proves to be an efficacious analgesic option for anesthesia providers in conjunction with general anesthesia for patients undergoing modified radical mastectomies. However, they remain underutilized by the anesthesia community. One of the principal reasons for their limited use is the lack of knowledge and variability in the provider's experience performing the PEC block. First introduced in 2011, the PEC block is a relatively new regional technique with opportunities for further exploration. Further research is required on the PECB's effect on PMPS and chronic pain. Another area of further research is the addition of different pharmacological agents in conjunction with local anesthetics to enhance and increase the duration of analgesia.

Conclusion

The current research on the pectoral nerve is an efficacious analgesic regional technique for modified radical mastectomies. As more providers become familiar with this technique, more anesthesia providers should utilize their use in practice. The thoracic paravertebral block and erector spinae block are less efficacious and are associated with more complications.

Primary DNP Project Goal

The primary goal of this project is to improve the knowledge of anesthesia providers the analgesic efficacy of the pectoral nerve block for breast cancer surgeries including modified radical mastectomy, modified radical mastectomy, partial mastectomy, and radical mastectomy with breast reconstruction. The setting for the study is located in Miami Beach, FL and has an estimated 35 anesthesia providers as well as an estimated 50 student and resident anesthesia providers. The anesthesia providers include anesthesiologist, CRNAs, resident anesthesiologist, and SRNAs. Although an average of breast cancer surgery procedures were not obtained at the site, they are frequently performed at this site. IV opioids in conjunction with other nonopioid

pharmacological agents is the most common analgesic technique performed for breast cancer surgeries. Although rarely utilized, the TPVB and ESPB are the primary regional techniques performed for mastectomy procedures.

DEFINITION OF TERMS

Pectoral Nerve Block (PEC 2 block)

NYSORA defines the Pecs II nerve block “as a regional technique where local anesthetic infiltrates two fascial compartments by dividing the dose of local anesthetic between the pectoral nerves (the pectoral fascia and clavipectoral fascia) and under the pectoralis minor muscle (between the clavipectoral fascia and the superficial border of the serratus muscle).”⁴

Thoracic Paravertebral Block (TPVB)

NYSORA states that Thoracic paravertebral block (TPVB) “is the technique of injecting local anesthetic alongside the thoracic vertebra close to where the spinal nerves emerge from the intervertebral foramen. This produces unilateral, segmental, somatic, and sympathetic nerve blockade, which is effective for anesthesia and in treating acute and chronic pain of unilateral origin from the chest and abdomen.”⁴

Erector Spinae Plane Block (ESPB)

NYSORA defines the erector spinae plane nerve block (ESPB) “as a recently introduced technique, and clear indications are still not well defined. Likewise, the mechanism of action is not fully understood; some studies suggest that an anterior diffusion of the local anesthetic into the paravertebral space could be one of the explanations, although an interfascial spread toward the posterior rami of spinal nerves is probably the main mechanisms of action.”⁴

Modified Radical Mastectomy

Jaffe and Samuels define the Modified radical mastectomy “as a surgical procedures with removal of the breast and axillary lymph nodes. Lumpectomy or re-excision.”¹²

Axillary Dissection

Jaffe and Samuels states, “In an axillary dissection, Levels I and II lymph nodes are removed. These nodes lie behind and lateral to the edge of the pectoralis minor muscle. The Level III, or highest group of axillary lymph nodes, are medial to the pectoralis minor muscle.”¹²

Theoretical Framework

The project's aspirations are to evaluate, educate, and determine what is needed at a professional level to introduce a more efficacious approach to current practice and ultimately improve patient outcomes. The Donabedian model provides the theoretical framework most consistent with the set goals and the ambitions of the project. With the use of the Donabedian model, a simple framework for the evaluation of care delivery outcomes. The evaluation of outcomes is performed with implementation of three primary concepts: structure, process, and outcomes.¹⁶ Implementation of Donabedian model is conducted first examining the organizational structure, which includes resources, available funds or finances, and lastly participants. The process, the second concept is determined by identifying the current utilization of care and the implementation of the timeline. Lastly, in the outcome concept participants invited to participate in the educational model provided and subjected to pre-and post-test to evaluate whether improved knowledge occurred. Conclusively, the Donabedian model provides a seamless framework to evaluate outcomes and provides a strong project configuration.

Goals and Outcomes

To facilitate the goals of the project, the SMART acronym was implemented. The SMART is an acronym designed to aid in the creation and development in goal objectives and stands for specific, measurable, achievable, realistic, and timely.¹²

Specific

Anesthesia providers will have enhanced their knowledge on the regional anesthetic technique known as the PEC block as an alternative approach to postoperative analgesia in breast cancer surgeries.

Measurable

To measure the effectiveness of the project, an analysis will be conducted by two questionnaires, one prior to the presentation of the information and another questionnaire following the completion of the presentation. Evaluation of the outcomes will be measured on the following topics: knowledge on the pain associated with mastectomies, pain pathway and nerve innervation of the breast, the nerves blocked in a PEC block, the analgesic efficacy of the PEC block, proper technique of performing a PEC block, and special considerations of the PEC block. The Qualtrics software will be utilized to generate the questionnaire, as well as analyzed the data.

Achievable

Anesthesiologist, Certified Registered Nurse Anesthetist, and Anesthesiologist Assistants will implement the PEC block into an ERAS protocol or Opioid Sparing protocol for mastectomy procedures.

Realistic

Anesthesia providers will be educated on the analgesic efficacy of the PEC block for postoperative mastectomy pain and how to perform the PEC block.

Timely

The development of the PEC block educational program will be developed within the next three months and will be available to anesthesia providers for 6 months.

Program Structure

The development of the PEC 2 Block educational program requires a comprehensive evaluation of the opportunities, values, and significance of implementing educational program on the implementation of the PEC block for postoperative analgesia in mastectomies. To aid in the initial evaluation a strength, weakness, opportunities, and threats (SWOT) analysis assessment tool will be implemented to identify the projects internal and external characteristics as well as potential threats.¹²

Prior to performing the SWOT analysis, key stakeholders must be identified to ensure that all factors of the SWOT analysis are adequately exhausted.¹² The key stakeholders consist of all anesthesiologists, certified registered nurse anesthetist, and anesthesiologist assistants, surgeons that perform breast cancer surgeries, and patients undergoing a mastectomy procedure. An expert mentor will aid in the design and implementation of the educational intervention on PEC 2 block for mastectomy. The participants will be provided a questionnaire prior to the educational intervention to determine the prior knowledge of the PEC 2 block. Upon completion, participants will take part in the educational intervention. The educational intervention will involve a in person lecture as well as a voice over PowerPoint lecture. Following the intervention, participants will be

provided a questionnaire survey that will analyze the variation in their knowledge pre and post educational intervention.

Strength

The anesthesia provider plays a vital role in combating the opioid pandemic in America. Post operative pain is among the most common complications associated with the mastectomy procedure. Although extremely effective analgesics, opioids potential for abuse, negative effects in surgical recovery, and their potential for metastasis makes a strong case for the use of regional anesthesia as an alternative analgesic strategy to reducing postoperative mastectomy pain.^{9,10} Current research reveals that PEC 2 blocks are effective prolong first request for opioid analgesics and at reducing opioid consumption in the immediate 24-hour following mastectomies are equally efficacious as the TPVB and ESPB.⁵⁻⁹ Improving surgical outcomes for patients a cornerstone to the envision anesthesia team. Increasing the use of PEC 2 block for mastectomy procedures through education of its analgesic efficacy fulfils the cornerstone.

PEC 2 blocks performed via ultrasound make the procedure safe, accurate, and relatively simple once proficient in the technique. Although TPVB is argued to be as effective analgesic with mastectomies, they also are associated with a higher rate of complications and increased difficulty in comparison to the PEC 2 block.⁵⁻⁸ The relative ease of becoming proficient in performing the PEC block and reduced rate of complication associated with the PEC 2 block will lead to more anesthesia providers considering this technique as part of the analgesic management for mastectomy procedures.

Weakness

The weaknesses can potentially damage the project plan must be thoroughly examined to fulfill the projects' goal. The first primary weakness is the delay in surgery start when

implementing a regional technique to the anesthesia plan. Currently, the anesthesia providers at Mount Sinai seldomly implement regional anesthesia because of the increased time preoperatively to perform the procedure and the delay in surgical start time. Although one benefit is that the PEC 2 block can be performed while the patient has been induced, the PEC 2 block is commonly performed pre-operatively.

Another weakness that can potentially negatively impact the project's goal is the variability in the skill of utilizing ultrasound to assist in regional anesthesia. Although TPVB is more complicated to perform more anesthesia providers, their preexisting knowledge and ability to perform TPVB could lead to anesthesia providers using more TPVB for post operative analgesia in mastectomy procedures. Lastly, the PEC 2 block for mastectomy's involves to separate injection to be performed for each breast. For patients undergoing a mastectomy involving both breast would receive a total of four separate injections. Multiple injections could lead to patients refusing to want the PEC 2 block performed prior to the mastectomy.

Opportunities

The opportunity of increasing the anesthesia providers knowledge on the use of PEC 2 blocks for postoperative analgesia in the mastectomy procedure provides another technique that anesthesia providers can implement to the analgesic plan to reduce the need for opioid analgesics postoperatively. Studies have shown that the PEC block is at the minimum an equally efficacious technique compared to the TPVB or ESPB in mastectomy procedures. Furthermore, The TPVB must be performed prior to the patient being anesthetized thereby delaying surgical start times. The PEC 2 block can be done following induction which could be advantageous for both the anesthesia provider as well as the patient. Conducting the PEC 2 block following induction of general anesthesia decreases the patients any pain, anxiety, or fears with needle injections due

them sedated prior to performing the PEC 2 block. For the anesthesia provider allowing the patient to be taken to the Operating room and under general anesthesia decreases the time to perform the procedure thereby reducing delays in the start of surgical procedure.

Threats

Analysis of potential threats to achieving the objectives of the project is key to the overall success of project.¹² A primary threat to the success of the project is the reluctance in anesthesia providers to learning a novel regional technique. Because the PEC 2 block is a novel technique anesthesia provider, variability among providers proficiency in performing the PEC 2 block could be problematic to increasing their use in mastectomy procedures.

As mentioned previously, the delay in surgical start time or increased the overall time of the procedure may lead to a decreased use of the PEC 2 block for mastectomies. This threat unfortunately accompanies all regional techniques and must be considered. Implementation of the PEC 2 block will require that anesthesia providers be aware of this threat and consider strategies to decrease any potential delays.

Due to Covid restrictions, implementation of an educational intervention for all the anesthesia providers could be difficult to achieve. To achieve the objectives the educational intervention will involve multiple unconventional education techniques. For example, the use of a voice over presentation PowerPoint rather than in person lecture. Although, this strategy could be utilized any follow up questions, concerns, or comments may be difficult to address.

Organizational Factors

One of the benefits of the project is that there no additional organizational factors that must be implemented to complete the project goal. Providing an educational intervention does

not require any additional purchases for the organization. Furthermore, Mount Sinai currently has all the required materials, equipment, and pharmaceuticals to perform the PEC 2 block. Implementation of the PEC 2 block requires all the same equipment, material, and pharmaceuticals that are already present at Mount Sinai and are often utilized for other regional anesthetic procedures.

METHODOLOGY

Setting and Participants

The study will be conducted at a surgical department of a hospital that provides inpatient and out-patient surgical procedures for patients. There are an estimated 50 anesthesia providers that provide anesthesia services for patients. The anesthesia providers include anesthesiologist, Certified Registered Nurse Anesthetists, Anesthesia residents, and Student Registered Nurse Anesthetist. The hospital is located in Miami Beach Florida.

Description of Approach and Project Procedures

The DNP project will start by inviting all anesthesia providers that provide anesthesia services for the hospital to participate in the study. All participants will be subjected to a pretest prior to the intervention to evaluate prior knowledge of the intervention. Prior to the educational intervention participants will also be questioned on years of experience, amount of breast cancer surgeries performed, most utilized analgesic technique for breast cancer surgeries, and amount of PEC blocks performed. Upon completion of the pretest and collecting of the previously stated data, an educational intervention focused on the nerve innervation of the breast, proper technique of the PEC block, the efficacy of PEC block, and possible complications associated with the PEC block. The educational intervention will include a segment for the anesthesia providers to elaborate on their personal opinions, expertise, questions, or concerns regarding the subject

matter. Upon completion of the intervention all participants will participate in the post-test with the same questions as the pretest.

Protection of Human Subjects

The Anesthesia providers participating in the study will be invited through the use of email. If the Institutional Review Board determines the project a minimal risk for participants, all participants must consent for the HIPPA compliance through the use of one of the following online survey platform such as REDCap, Qualtrics, or Survey Monkey e. Potential benefits for participants include improvement of knowledge on acute postoperative pain associated with breast cancer procedures, sensory nerve innervation of the breast, proper PEC block technique, and the analgesic efficacy of the PEC block in comparison to other common utilized analgesic techniques for breast cancer surgeries. There will be no identifiable data collected throughout the study and all data will be password protected through the use of a storage online database only accessible to the primary investigator.

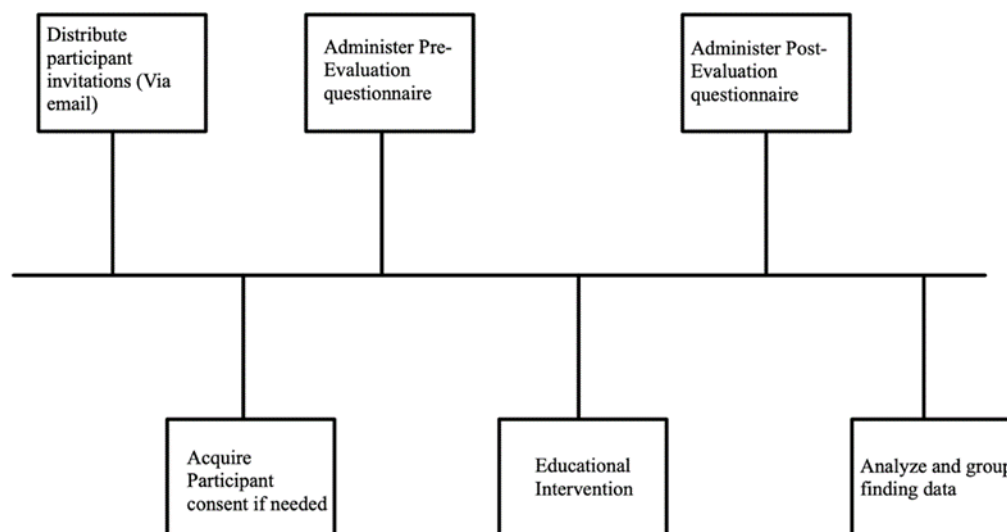
Data Collection and Analysis Plan

Data regarding each participant experience in performing mastectomy procedures and the analgesic technique most often utilized will be collected. Specifically, the years of experience of providing anesthesia, how often each participant performs anesthesia for mastectomy, primary analgesic technique utilized for mastectomy procedures, experience level and amount of PEC 2 blocks performed. The results of pre and post-test will be calculated on a point system with the correct answer selection receiving one point and incorrect answer selection receiving 0 points. The data collected on the results of the pre- and post-test will include the average scores of both test as well as the most commonly missed questions for each exam.

TIMELINE

Project Timeline

1. Develop the education intervention
2. Develop the questionnaire
3. Request CBMCS permission
4. Receive IRB approval
5. Choose an electronic database
6. Create and send study invitation
7. Administer pretest questionnaires
8. Perform educational intervention
9. Administer posttest questionnaire
10. Record participants responses
11. Analyze the anonymous data

Figure 1: Project Timeline

Description of the project timeline

RESULTS

Participants Demographics

Of the 57 participants invited to participate in the study, a total of four participants volunteered to complete the study. As shown in Table 2, all four participants were female, had their doctorate degree in Nurse Anesthesia, and had over 10 years of experience. The age range for the participants included 1 (25%) between the age of 35-45 years of age, 2 (50%) between the age of 46-55, and 1 (25%) which did not include their age. The following table highlights these demographics.

Table 2: Demographics of Participants

Demographics	N(%)
Male	0
Female	4(100%)
35-45	1 (25%)
45-55	2 (50%)
Prefer not to answer	1(25%)
Bachelors	0

Masters	0
Doctorate	4(100%)
0-2	0
0-3	0
4-10	0
10+	1(100%)

Summary of Results

Following participant consent and demographics were collected the participants completed a pre-test consisting of ten questions. After completion of the pre-test the participants watched an educational video on the use of PEC block for Radical Mastectomy procedure that was provided via a link. Upon completion of the educational video the participants took a post-test consisting of the same questions as the pre-test. The purpose of the study is to see if learning occurred following the completion of the educational video.

As seen in Table 3, each participant received a randomized ID number which allowed the pre and post test results to be compared for each participant. The first participant answered 2 (20%) of the 10 questions correctly on the pre-test and answered 8 (80%) out of the 10 questions correctly in the post-test. Participant two answered 6 (60%) question correctly on the pre-test and 7 (70%) questions on the post test. Participant three answered 2 (20%) of the questions correctly on the pre-test and 7 (70%) questions on the post-test correctly. The fourth participant answered 8 (80%) correct on the pre-test and 9 (90%) questions correct on the post-test. All four participants showed learning occur following the educational video. Participant one and three showed marked improvement in the number of questions correct by six and five questions respectively. Whereas participants two and four improved marginally from the pre-test and post-test by one question each. The Following table reveals the results of the participant pre and post survey questions.

Table 3: Pre/Post Survey Results

participants	1		2		3		4	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
question 1	Y	Y	N	N	N	N	Y	Y
question 2	N	Y	N	N	N	Y	N	Y
question 3	N	N	N	Y	N	Y	Y	Y
question 4	Y	Y	Y	Y	N	Y	Y	Y
question 5	N	N	Y	Y	N	Y	Y	Y
question 6	N	Y	Y	Y	N	N	Y	Y
question 7	N	Y	Y	Y	Y	Y	Y	Y
question 8	N	Y	Y	Y	Y	Y	Y	Y
question 9	N	Y	N	N	N	Y	N	N
question 10	N	Y	Y	Y	N	N	Y	Y
Score	20%	80%	60%	70%	20%	70%	80%	90%

Limitations

Upon conclusion of the study and results analyzed limitations to the study included a limited number of participants of the study. Furthermore, all participants were female with over ten years of experience. Further research involving more participants and a wider range of experience an anesthesia should be conducted to identify the need for education on the use of PEC blocks in combination with general anesthesia in Radical mastectomy procedures.

Discussion of the Results and Implications to Advanced Nursing Practice

An effective hypothesis could provide several positive implications. First anesthesia will have improved knowledge on the analgesic efficacy of the PEC 2 block for mastectomy procedures and have an additional option to combat post operative pain following mastectomy. Secondly, anesthesia providers with little or no experience on the PEC 2 block will have improved knowledge on the technique, complication, considerations, and contraindications.

Anesthesia providers will also have improved knowledge on the pain response to mastectomy, specifically the sensory nerve innervation involved in the removal of breast tissue and the potential complications associated with ineffective acute pain management following mastectomies. The culmination of these positive implications could lead to better acute pain management for patients undergoing breast cancer surgeries.

Conclusion

Current literature on the use of PEC blocks for radical mastectomy procedures in comparison to ESPB and TPVB reveals that PEC blocks are equally efficacious for postoperative analgesia, with a wider range of anatomical coverage and reduction in potential complications. Following completion of the study all participants revealed that learning occurred following the educational video supporting the hypothesis. Limitations of the study included a limited amount of participants and experience levels. Following completion of the study all four participants are more likely to consider the use of PEC 2 block for radical mastectomies in combination with general anesthesia.

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Appendix A



MEMORANDUM

To: Dr. Valerie Diaz
CC: Anthony Avila
From: Elizabeth Juhasz, Ph.D., IRB Coordinator *EJ*
Date: April 8, 2022
Proposal Title: "An Educational Module Explaining The Analgesic Efficacy Of The PEC Block For A Radical Mastectomy: A Quality Improvement Project"
Approval # IRB-22-0091-AM01
Reference # 111564

The Florida International University Office of Research Integrity has approved the following modification(s):

- The target population of the project will consist of approximately ten anesthesia providers working at Broward Health instead of Mt Sinai Medical Center (MSMC).
- MSMC can no longer accommodate this project because of the volume of students assigned to the clinical site.

There are no additional requirements in regards to your study. However, if there are further changes in the protocol after you commence your study, then you are required to resubmit your proposal for review. For further information, you may visit the FIU IRB website at <http://research.fiu.edu/irb>.

Appendix B



CONSENT TO PARTICIPATE IN A QUALITY IMPROVEMENT PROJECT

“An Educational Module for the Utilization of PEC Blocks in Combination with General Anesthesia for Postoperative Analgesia in 18 Years and Older Undergoing Radical Mastectomy and Modified Radical Mastectomy Procedure.”

SUMMARY INFORMATION

Things you should know about this study:

- **Purpose:** Educational module concerning use of PEC block for Radical Mastectomy and Modified Radical Mastectomy
- **Procedures:** If you choose to participate, you will be asked to complete a pretest watch a voice PowerPoint, and then a post-test
- **Duration:** This will take about a total of 20-minute total.
- **Risks:** The main risk or discomfort from this research is minimal
- **Benefits:** The main benefit to you from this research is increase the participants knowledge of the analgesic efficacy of PEC block in mastectomy procedures.
- **Alternatives:** There are no known alternatives available to you other than not taking part in this study.
- **Participation:** Taking part in this research project is voluntary.

Please carefully read the entire document before agreeing to participate.

PURPOSE OF THE PROJECT

The goal of this project is to decrease postoperative pain using the PEC block in combination to general anesthesia in women greater than 18 years old undergoing radical mastectomy and modified radical mastectomy old through an educational intervention targeting certified registered nurse anesthetists (CRNAs). You are being asked to participate in this quality improvement project.

NUMBER OF STUDY PARTICIPANTS

If you decide to participate, you will be one of approximately 10 people in this study.

DURATION OF THE PROJECT

Your participation will require about 20 minutes of your time.

PROCEDURES

If you agree to be in the project, we will ask you to do the following things:

RISKS AND/OR DISCOMFORTS

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

BENEFITS

The following benefits with your participation in this project: An increase in your knowledge surrounding the technique, analgesic efficacy, and risk of complications with a PEC block in combination with general anesthesia for radical mastectomy and modified radical mastectomy procedures.

ALTERNATIVES

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

CONFIDENTIALITY

The records of this project will be kept private and will be protected to the fullest extent provided by law. If, in any sort of report we might publish, we will not include any information that will make it possible to identify you as a participant. Records will be stored securely, and only the project team will have access to the records.

PARTICIPATION: Taking part in this research project is voluntary.

COMPENSATION & COSTS

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

RIGHT TO DECLINE OR WITHDRAW

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

RESEARCHER CONTACT INFORMATION

If you have any questions about the purpose, procedures, or any other issues relating to this research project, you may contact Anthony Avila at (954) 643-7266 or aavil073@fiu.edu or Valerie Diaz at vdiaz@fiu.edu.

IRB CONTACT INFORMATION

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

PARTICIPANT AGREEMENT

I have read the information in this consent form and agree to participate in this study. I have had a chance to ask any questions I have about this study, and they have been answered for me. By clicking on the "consent to participate" button below I am providing my informed consent.

Appendix C



Nicole Wertheim College of Nursing & Health Sciences

Uses of Immersive Virtual Reality Distraction as an adjunct to anesthesia to decrease levels of pain in patients experiencing acute procedural pain: An Evidence Based Educational Module

Dear Anesthesia Provider:

My name is Anthony Avila and I am a student from the Anesthesiology Nursing Program Department of Nurse Anesthetist Practice at Florida International University. I am writing to invite you to participate in my quality improvement project. The goal of this project is to improve health care provider knowledge on the uses of PEC block as an adjunct to general anesthesia to decrease levels of pain in the postoperative setting following radical and modified radical mastectomy. You are eligible to take part in this project because you are a member of the Anesthesia Department for Anesco.

If you decide to participate in this project, you will be asked to complete and sign a consent form for participation. Next, you will complete a pre-test questionnaire, which is expected to take approximately 5 minutes. You will then be asked to view an approximately 15 minute long educational presentation online. After watching the video, you will be asked to complete the post-test questionnaire, which is expected to take approximately 5 minutes. *No compensation will be provided.*

Remember, this is completely voluntary. You can choose to be in the study or not. If you'd like to participate or have any questions about the study, please email or contact me at aavil073@fiu.edu or 954-643-7266.

Follow this link to the Survey:

`#{l://SurveyLink?d=Take the Survey}` Or copy and paste the URL below into your internet browser:

`#{l://SurveyURL}`

Follow the link to opt out of future emails:

`#{l://OptOutLink?d=Click here to unsubscribe}`

Appendix D



Miami Beach Anesthesiology Associates, Inc.

Mount Sinai Medical Center • Division of Anesthesia

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Gerald Rosen MD
Residency Program
Director

Jason Wigley MD
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Co-Assistant Director

Alexander Volkov MD

Jennifer Wright MD

J.P. Mato DNP, CRNA
CRNA Director & SRNA
Coordinator

Paula Schultz DNP, CRNA
OB-Chief CRNA

February 1, 2022

Dr. Valerie Diaz, DNP, CRNA, APRN
Assistant Professor
Department of Nurse Anesthesiology
Florida International University

Dr. Diaz,

Thank you for inviting Mount Sinai Medical Center to participate in Doctor of Nursing Practice (DNP) project conducted by Anthony Avila entitled "An Educational Module Explaining The Analgesic Efficacy Of The PEC Block For A Radical Mastectomy: A Quality Improvement Project" in the Nicole Wertheim College of Nursing and Health Sciences, Department of Nurse Anesthesiology at Florida International University. I have given the student permission to conduct the project using our providers.

Evidence-based practice's primary aim is to yield the best outcomes for patients by selecting interventions supported by the evidence. This proposed quality improvement project seeks to investigate and synthesize the latest evidence.

We understand that participation in the study is voluntary and carries no overt risk. All Division of Anesthesia providers are free to participate or withdraw from the study at any time. The educational intervention will be conveyed by a 15-minute virtual PowerPoint presentation, with a pretest and posttest questionnaire delivered by a URL link electronically via Qualtrics, an online survey product. Responses to pretest and posttest surveys are not linked to any participant. The collected information is reported as an aggregate, and there is no monetary compensation for participation. All collected material will be kept confidential, stored in a password encrypted digital cloud, and only be accessible to the investigators of this study: Anthony Avila and Dr. Diaz.

Once the Institutional Review Board's approval is achieved, this scholarly project's execution will occur over two weeks. Anthony Avila will behave professionally, follow standards of care, and not impede hospital performance. We support the participation of our Division of Anesthesia providers in this project and look forward to working with you.

Respectfully,

Jampierre (J.P.) Mato, DNP, CRNA, APRN
Executive CRNA Director
SRNA Coordinator/Supervisor
Electronic Mail: Jampierre@bellsouth.net
Mobile Phone: 954-668-6080

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Appendix E



Pretest and Posttest Questionnaire:

Analgesic Efficacy of Pectoral Nerve Block (PEC Block) In Combination with General Anesthesia for Adult Female Patients Undergoing Radical Mastectomy or Modified Radical Mastectomy Quality Improvement Project

INTRODUCTION

The primary aim of this QI project is to improve the knowledge of CRNAs pertaining to the utilization of a PEC block in combination general anesthesia for Radical Mastectomy and Modified Radical Mastectomy procedures to reduce post-operative pain and opioid consumption in the first 24 hours after surgery.

Please answer the question below to the best of your ability. The questions include demographic information and knowledge of PEC blocks in adult female patients undergoing either Radical Mastectomy or Modified Radical Mastectomy. Questions are either in multiple choice and are meant to measure the CRNAs knowledge of the analgesic efficacy of PEC block in comparison to Thoracic Paravertebral Block (TPVB) and Erector Spinae Plane Block (ESPB) at reducing postoperative pain, opioid consumption, delay first request for pain medication in the first 24hours following Radical Mastectomy or Modified Radical Mastectomy Procedures.

PERSONAL INFORMATION

1. **Gender:** Male Female Other _____
2. **Age:** _____

3. **Ethnicity:**
 Hispanic Caucasian African American Asian Other_____
4. **Position/Title:** _____
5. **Level of Education:** Associates Bachelors Masters Doctoral (DNP, DNAP, EdD, PhD) _____
6. **Years of experience:** (Less than 1 year) (1 to 5) (6 to 10) (more than 10 years)
7. **Amount of PEC blocks performed in your career:** (0-5) (5-10) (10-20) (20 or more)
8. **How likely are you to consider regional anesthesia and which type for mastectomy and other related breast cancer surgeries:** (not likely) (somewhat likely) (most likely)
9. **which type for mastectomy and other related breast cancer surgeries:** {PEC block) (TPVB) (ESPB) (other)

QUESTIONNAIRE

- 1) **All the following are muscles involved in the PEC block, except?**
- Serratus Anterior
 - Pectoralis Minor
 - Pectoralis Major
 - Internal Intercostals
- 2) **Which nerve does the PEC block anesthetize that neither the ESPB and TPVB anesthetize?**
- Lateral Pectoral Nerve
 - Long Thoracic Nerve
 - Brachial Plexus

- d) Subclavius
- 3) Which of the following are potential complications with the PEC block? (choose two)**
- a) Phrenic nerve paralysis
 - b) Pneumothorax
 - c) Local anesthetic toxicity
 - d) Frozen shoulder
- 4) Which of the following is not true regarding use of Opioids and Radical Mastectomies?**
- a) Opioid analgesics is associated a higher rate poor patient outcome in mastectomy procedures in comparison to the combination of general anesthesia and regional anesthesia.
 - b) Opioids have been linked to the potentiation of tumor progression.
 - c) Patients receiving postoperative IV opioid analgesics are more likely to experience nausea and vomiting in comparison to when regional anesthesia is utilized for postoperative pain.
 - d) Postoperative mastectomy patients receiving opioid IV analgesics have lower pain scores in the first 24 hours than when regional anesthesia in combination with general anesthesia.
- 5) What is the volume of local anesthetic administered into each injection With the PEC 2 block?**
- a) 1-2 ml
 - b) 10 ml
 - c) 20 ml
 - d) 25 ml
- 6) Which of the following is not a benefit of PEC blocks over TPVB in Radical Mastectomy Procedures?**
- a) Less rate of complications.
 - b) Can be performed perioperatively.
 - c) Provides superior analgesia to axilla.
 - d) Requires less local anesthetic administration.
- 7) What are the most common regional anesthetic techniques utilized for analgesia in breast cancer surgery?**
- a) Erector Spinae Plane Block (ESPB)
 - b) Thoracic Paravertebral Block (TPVB)
 - c) Pectoral Nerve Block (PEC block)
 - d) A and C
 - e) A,B, and C

- 8) What are the most common reasons for the underutilization of a PEC block in combination with general anesthesia for patients undergoing Radical Mastectomy or Modified Radical Mastectomy? (Choose two)**
- a) Delays in surgical start time
 - b) Must be performed prior to Induction
 - c) Variable proficiency in PEC block technique among anesthesia providers
 - d) Inferior analgesic efficacy in comparison to the TPVB and ESPB
- 9) The PEC block has been shown to help prevent what potential complication associated with the Radical Mastectomy and Modified Radical Mastectomy procedures?**
- a) Chronic Pain
 - b) Frozen Shoulder
 - c) Pneumonia
 - d) Pneumothorax
- 10) Which of the following statements is true regarding PEC blocks?**
- a) Does not require Ultrasound technology to perform
 - b) Inferior analgesic efficacy for breast cancer surgeries in comparison to a ESPB
 - c) Can impede surgical access
 - d) Can be performed preoperative, perioperative, or postoperative setting.

Appendix F



1

Learning Goals

- Discuss the use of PEC Block in combination with General Anesthesia (GA) in Radical Mastectomy and Modified Radical Mastectomy Procedures.
- Understand the potential problems with Opioid Analgesics for pain management in breast cancer surgery.
- Describe the key points regarding the Anatomy and Physiology of the PEC block.
- Compare and contrast advantages of the PEC block to the TPVB and ESPB.

FIU

2

Background

Estimated 250,000 women in U.S. diagnosed for breast cancer yearly.

Radical Mastectomy is the most common treatment for breast cancer patient.

Moderate to severe post-operative pain is one of the most common complication with mastectomy procedures.

FIU

3

Scope of the Problem

Opioids effective analgesics for moderate/severe postoperative pain.

Associated with higher narcotic pain patient outcomes.

Increased respiratory depression, nausea, vomiting, constipation, and sedation.

Associated with higher narcotic pain patient outcomes.

FIU

4

Underutilization of Regional Anesthesia

Underutilization of Regional Anesthesia in combination GA for mastectomy procedures are likely due to:

- Delay in logistic readiness
- Limited or no clinical practice experience in Regional Anesthesia
- Inadequate interoperative analgesic/regional anesthesia

5

Benefits of Regional Anesthesia for Mastectomy Procedures

- Regional anesthesia in combination with general anesthesia in Radical Mastectomy procedures:
 - Provides effective postoperative analgesia.
 - Decreases total amount of opioid consumption in first 24 hours after procedure.
 - Delays or prevents pain medication.
 - Associated with less nausea and vomiting.

Thoracic Paravertebral Block (TPVB)
Erector Spinae Plane Block (ESPB)
Pectoral Nerve Block (PEC Block)

FIU

6

Muscles and Nerve Innervation

4 muscles related to the PEC Block:

- The pectoralis major and minor muscles are innervated by the lateral and medial pectoral nerves
- the serratus anterior is innervated by the long thoracic nerve (C5, C6, and C7)
- subclavius is innervated by the upper trunk of the brachial plexus (C5 and C6)

FIU

7

PEC Block Technique

- PEC 1: Fascial plane between pectoralis major and pectoralis minor
- PEC 2: Lateral to PEC 1 between pectoralis minor and serratus anterior muscle

FIU

8

PEC Block vs. TPVB

The Advantages of the PEC Block in comparison to TPVB in Patient Monitoring and SPB Control:

- Superior analgesic efficacy
- Lower postoperative pain scores in the 24 hrs.
- Fewer opioid and non-opioid analgesic requirements
- Lower analgesic consumption
- Easier to perform
- Can be performed after induction of general anesthesia

FIU

9

PEC BLOCK vs ESPB

The Advantages of the PEC Block in comparison to ESPB are similar to the same as the TPVB:

- Superior analgesic efficacy
- Lower postoperative pain scores in the 24 hrs.
- Fewer opioid and non-opioid analgesic requirements
- And lower total dose of opioids required in the first 24hrs.

Clearer and simpler to be performed prior to induction

Simple technique to perform

FIU

10

Drawbacks to the PEC block

- Due to the recent discovery of the brachial plexus, previous knowledge and following were greatly wrong medicine practice
- Prone to use of ultrasound machine
- If performed intraoperatively, ultrasound cannot ensure the quality of the PEC block

FIU

11

Take Home Points

- The PEC Block in comparison with TPVB in Patient Monitoring and SPB Control provides superior analgesic efficacy, less opioid consumption, and lower analgesic requirements
- The PEC Block is of similar quality, duration, and SPB and ESPB are similar studies showing the PEC block
- Clearer and simpler to be performed prior to induction
- Easier to perform
- Can be performed after induction of general anesthesia
- Lower postoperative pain scores in the 24 hrs.
- Fewer opioid and non-opioid analgesic requirements
- And lower total dose of opioids required in the first 24hrs.

FIU

12

Summary

The PDC block in combination with GA for mastectomy procedures is an alternative to TPIR and CGR, and has several advantages:

- Equal if not superior analgesic efficacy
- Greater flexibility in when the procedure can be performed
- Simpler technique and associated with fewer complications

FIU

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