Implementation of the PECS II Block in Mastectomy Patients

By

Brianna O. Davis

Under Supervision of

Richard P. Conley Jr.

Second Reader

Yanka Campbell

A DNP Project Manuscript
Submitted in Partial Fulfillment of the Requirements for the
Doctor of Nursing Practice Degree

University of Maryland School of Nursing

May 2023

Author Note

There is no known conflict of interest to disclose. Correspondence concerning this article should be emailed to bodavis@umaryland.edu.

Abstract

Problem: Acute pain associated with mastectomies occurs 60% of the time in the postoperative phase. In addition to acute pain, these patients can develop chronic pain and upper arm restrictions due to untreated pain. There has been a shift in utilizing regional anesthetic techniques to counteract increased opioid consumption and misuse. At a community hospital located in Maryland, those undergoing mastectomies required Dilaudid, a narcotic, 80% of the time for postoperative pain. **Purpose:** The purpose of this Quality Improvement Project was to implement a protocol for anesthesia providers to utilize when performing the PECS II nerve block to reduce postoperative pain in mastectomy patients. **Methods:** The quality improvement project took place over 15 weeks. The PECS II nerve block protocol was readily available for anesthesia providers for local anesthetic dosing and criteria. Compliance with the protocol was measured along with pain scores in the postoperative area. **Results:** There were a total of 24 mastectomy cases. The compliance rate during weeks 1-3 was 50%. Compliance for weeks 4 through 6 was 33%. There was a 50% compliance rate for weeks 7-9. The median increased from 16.5% in weeks 9-11 to 75% for weeks 12-15. Out of the patients who received a PECS II nerve block, 11 out of those 13 had pain scores of less than five throughout the entire postoperative period. For those who did not receive a PECS II nerve block, only seven out of 11 patients had a pain score of less than five in the first 15 minutes of entering the post anesthesia care unit (PACU). **Conclusions:** The number of anesthesia providers adhering to the PECS II nerve block protocol steadily increased as more providers were trained to perform the block. The incidence of pain scores above five in those who received the block was considerably lower. Out of those patients, 92% receiving the block had a pain score of less than five throughout their stay in the PACU.

Keywords: acute pain, opioid, PECS II nerve block, mastectomy

Implementation of the PECS II Block in Mastectomy Patients

Patients with breast cancer undergoing a mastectomy have a 60% risk of developing severe acute pain in the postoperative phase of care (Fecho et al., 2020). Uncontrolled acute pain can sequentially lead to chronic pain and opioid misuse. Among surgical patients, those who have undergone a mastectomy have a 13-43% risk of prolonged opioid use due to chronic pain (Fecho et al., 2020). Furthermore, patients who are opioid naïve have a 10% chance of becoming persistent opioid users (Cogan et al., 2021). The use of regional anesthetics, specifically the pectoral nerve block II (PECS II), has shown to be beneficial in preventing pain, decreasing the use of opioids, and further decreasing the chance of post-mastectomy pain syndrome (Yuksel et al., 2022). The rates of tumor reoccurrence due to long-term opioid use are also of concern and further support the incorporation of regional anesthetic techniques into the anesthetic plan of these patients. The role in regional anesthesia in preventing cancer recurrence has been linked to the reduction in surgical stress and decrease cytokine mediated stress response (Grandhi et al., 2017).

At a community hospital in Maryland, there were around 100 mastectomy cases performed at the institution. The patients undergoing a mastectomy experienced an 8/10 pain score on average when rating pain on the numerical rating scale (NRS) in the post-anesthesia care unit (PACU). Severe post-operative pain traditional was treated in the PACU by administering intravenous (IV) narcotics such as Dilaudid. At this institution, baseline data showed that 80% of patients received IV Dilaudid for pain control after a mastectomy. High-dose narcotic exposes patients to further complications such as post-operative nausea and vomiting (PONV), decreased patient satisfaction, and is associated with increased higher healthcare costs (Al' Jabari et al., 2019). PONV at this facility was controlled in the PACU by

administering IV Phenergan, which predisposed the patient to side effects such as sedation. On average, the length of the stay (LOS) for breast mastectomy patients was one to three hours in the PACU, barring issues with uncontrolled pain or nausea, which led to hospital admissions.

Literature Review

In a literature review**,** the Pecs II nerve block demonstrated a higher ability to control pain with reduced narcotic consumption up to 48 hours postoperatively (Appendix A). In the study conducted by Al' Jabari et al. (2019), patients who received or did not receive a block were compared. The results showed individuals receiving a mastectomy with a preoperative Pecs II block had a 24-48 morphine dosage reduction. In the group that received a block, post-op morphine dosage on average was 5.2 mg compared to 8.9 mg in patients who did not receive a block.. Altıparmak et al. (2019) compared the Erector Spinae Plane block (ESP) with the Pecs II block for pain control in patients undergoing a radical mastectomy. Those who received an ESP block received 196 mg of Tramadol compared to those in the Pecs II group who received 132 mg. Kulhari et al. (2016) compared an older, more invasive technique, the thoracic paravertebral block (TPVB), against the Pecs II block. Those in the TPVB group first rescue dose of analgesia was 31.35 minutes compared to the Pecs II group, which was 52.76 minutes. In the study conducted by Versyck et al. (2017), patients undergoing Pecs II block vs. those who did not receive the block required significantly fewer opioid interventions during their PACU stay.

A synthesis of the evidence, including all randomized controlled studies, showed a significant reduction in narcotic use and controlled pain scores (Appendix A). Kulhari et al.'s study and Altiparmak et al.'s study both compared the Pecs II block to older regional anesthetic techniques. The Pecs II block proved to be superior in all studies in the efficacy of pain management and safety.

The purpose of this quality improvement (QI) project was to create and implement a protocol for the use of the Pecs II block for patients undergoing a mastectomy to reduce post-operative pain. The process goal of this QI project was that 100% of mastectomy patients will receive a Pecs II block. The outcome goal was that 100% of breast mastectomy patients will experience a pain score of less than five on the NRS scale in the PACU.

Theoretical Framework

The framework chosen for this QI project was the Knowledge to Action Framework (KTA), depicted in Figure 1. The KTA framework was initially developed by Ian Graham, Ph.D., in 2006. It consists of two distinct components: the knowledge creation funnel and the action cycle. A knowledge synthesis was done through a literature review on the Pecs II blocks role in pain management. Incorporating knowledge consisted of an educational session conducted at the anesthesia staff meeting. During the meeting, knowledge on how to perform the Pecs II block, benefits, dosing, and location of the new protocol for reference were explained to anesthesia providers.

The action phase of the KTA framework helped guide the work for implementing the project. Assessments of barriers and earlier adopters were done using the Organizational Readiness to Change Assessment tool (Helfrich et al., 2009). The selection and tailoring of interventions were done by disseminating post-operative pain scores. A goal for the QI-PL was that through sharing statistics on decreased pain scores, providers would be motivated to continue or begin to implement Pecs II blocks.

Methods

Context

At this facility, patients presenting for mastectomy cases were consented to a general anesthetic. Narcotics were given intraoperatively and postoperatively to control pain. There was no standing policy for the administration of the Pecs II block. Providers did not inform patients in the preoperative phase of the benefits of receiving a peripheral nerve block for pain control. The previous process is depicted in Figure 2. The goal of the QI project was to create and implement a protocol for the Pecs II nerve block. Patients were excluded or included based on infection at the site, coagulopathy, allergy to local anesthetics, and BMI > 45 kg/m^2. The Pecs II block was performed in the preoperative phase before transferring to the operating room (OR). The block was performed by a physician anesthesiologist or certified registered nurse anesthetist (CRNA). Dosing was based on the protocol in place. The current process is outlined in Figure 3.

There were contextual factors at the institution impeding the implementation of the Pecs II block in mastectomy patients. They included patient, institution, and technology factors (Figure 4). The patient factors included variations in anatomy among surgical patients increasing the difficulty of the block placement. Individuals with larger breast tissue increase difficulty performing the Pecs II block. Institutional factors included a lack of policy in place and performance of regional blocks left to the discretion of the provider. Technological factors of concern were the availability and quality of the ultrasound equipment necessary to perform the block. The previous ultrasound machine was an older model, but a newer model was used on a trial basis and has since been purchased. At the institution, the key facilitators and team members included two breast surgeons who expressed interest in allowing patients to receive the Pecs II block. The Chief Anesthesiologist of the Anesthesia Department and the Chief CRNA worked to

ensure compliance among the anesthesia staff in the performance of the blocks. Lastly, the IT specialist helped facilitate a review of patient pain scores in the PACU area.

Intervention

The intervention proposed for this project was the creation and implementation of a protocol for administering the Pecs II block in mastectomy patients. The protocol outlined local anesthetic dosing and patient selection. The protocol was used to prevent variations between providers. Since the block was a new regional technique at the site, ensuring guidance on performing the block helped to guide the implementation and improve outcomes.

Implementation tactics were divided into the following groups: accountability, buy-in, collaboration, data, and education. Education was one of the key implementation strategies selected during the planning phase. Verbal interaction was used to assess the staff's comprehension of the PECS II nerve block and its benefits. There were educational handouts provided to the anesthesia staff as well as educational videos on how to perform the PECS II nerve block. After the meeting, the staff was able to voice any concerns or questions regarding how to perform the block, benefits, or the implementation process. This was done to create a more interactive learning environment for the staff. Following education, the Quality Improvement Project Lead (QI-PL) posted the protocol in each operating room for use when performing the PECS II nerve block.

To facilitate buy-in, statistics were provided to staff on the long-term complications/effects of those undergoing mastectomies including narcotic misuse. This helped depict the seriousness of incorporating alternative techniques to control pain in these patients. Collaboration was used as another implementation strategy. The clinical site representative (CSR) and QI-PL both selected champions to facilitate the project. Two anesthesiologists and the CSR attended a local surgery

center as a shadow day on how to perform the block. Once their training was completed, these individuals were accessible for other staff to learn how to perform the PECS II nerve block. This allowed the block to be performed more often.

Measures

Three goals were set for the project, including process, structure, and outcome goals. The structure goal was to establish a protocol for administering the Pecs II block prior to implementation. This goal was measured by the protocol's existence by the proposed date (Figure 5). The process goal of 100% administration of the Pecs II block for mastectomy patients was measured by chart review to verify documentation of the block. The outcome goal was 100% of mastectomy patients demonstrating a pain score of less than five using the numerical pain rating scale. The pain scores were examined during the pre-implementation phase, as a baseline comparison, and implementation phases. Pain scores were evaluated on arrival to the PACU, 15 minutes after arrival, 30- minutes, and at 1-hour intervals until discharge.

The compliance of the PECS II nerve block protocol was evaluated through chart review of mastectomy cases performed each week. The anesthesia provider charted whether a PECS II nerve block was used, and the dosage administered. The effect of the PECS II nerve block on pain was also examined through the review of postoperative pain scores throughout the recovery period up until discharge. The block being performed was largely provider-dependent which in turn affected assessing the achievement of the process goal. There was a direct linkage between the PECS II nerve block being implemented and provider capability, with improvement in administration of the PECS II nerve block protocol following a shadow day attended by two anesthesia providers.

Quantitative data analysis was conducted via run charts. The run chart was used to examine the process goal in whether anesthesia providers were compliant in performing the peripheral nerve block for mastectomy cases over a 15-week period. The run chart was used to assess for a common cause or special cause variation in the process. A common cause variation is natural and can be expected. On the other hand, special cause variations are due to a known factor having a direct effect on a certain process. Common cause variations were expected to occur within the pre-implementation phase. The special cause variations are due to a change or special event occurring which would be the incorporation of the Pecs II block. Lastly, pain scores are displayed on a table at each time interval. The chart was subdivided into those who received the PECS II nerve block and those who did not.

Ethical Considerations

Anesthesia providers used paper charting to document performance of anesthetic procedures, such as the PECS II block. The paper records were reviewed at the facility in a secure location. The postoperative pain scores were charted in the electronic health record. This information was retrieved onsite using a password protected computer. Data collection was performed using REDCap, which is HIPAA-compliant, and password protected data collection system. Lastly, a Non-human Subject's Research designation was obtained from the Human Research Protections Office of the University Institutional Review Board prior to implementation of this project. Approval from the site was also obtained prior to conducting the QI initiative.

Results

There were three goals set for the initiation of the QI project. The structure goal of establishing a protocol for the PECS II nerve block was met. The protocol was available for staff within the anesthesia office and operating room suites. There was a total of 24 mastectomy cases during the implementation phase. Out of the 24 cases, 11 patients did not receive the block resulting in the outcome goal not met. The compliance with the PECS II nerve block protocol was 50% for weeks 1-3 and 7-9, and 33% for weeks 4-6. The median of performance of the PECS II nerve block increased from 16.5% in weeks 9-11 to 75% for weeks 12-15. This data is displayed in a run chart in Figure 6. In regard to postoperative pain scores, those who received the block experienced a pain score of less than five 92% of the time in the postoperative recovery phase. The outcome goal of 100% of mastectomy patients experiencing a pain score of less than 5 was not met. Those who had not received the block experienced a pain score of five or more 100% of the time during some point in their recovery period. Out of the 13 patients who received the PECS II nerve block, 11 had pain scores less than five in the PACU up until their discharge. In those patients who did not receive the block, only seven had a pain score less than five within the first 15 minutes of entering the PACU. These pain scores are detailed more in Table 1.

The largest facilitator contributing to a shift in the median compliance was due to the shadow day attended by two anesthesia staff members. The key facilitators of the QI project, the Chief CRNA and both breast surgeons, helped with the facilitation of the project when the QI-PL was not at the site. An initial barrier to the QI project was the unfamiliarity on how to perform the PECS II nerve block by several anesthesia providers. Costs were minimal, and the medications used for the nerve block were readily available to the anesthesia providers.

Discussion

The implementation of the PECS II nerve block at the facility proved to be efficacious in reducing pain scores in the postoperative period. Both breast surgeons also provided follow up information in post discharge patient outcomes which showed an advantageous effect of performing the nerve block. Patients who received the block were able to report pain relief well into discharge home. The costs of performing the PECS II nerve block were not extensive due to accessibility of the local anesthetic. The PECS II nerve block also proved to be cost effective by reducing narcotic consumption in the PACU.

The literature showed a positive correlation between the use of the PECS II nerve block and reduced pain scores and narcotic usage. As stated previously, this translated into practice during the QI project. Initially, the limited number of anesthesia providers comfortable with performing the nerve block affected implementation data. Following training, more patients were able to receive the block. The anesthesia staff's receptiveness to this practice change also was helpful in guiding this QI project.

Conclusions

The incidence of severe acute pain in the postoperative period necessitates the need for other adjuncts such as peripheral nerve blocks in this patient population. The PECS II nerve block is a technique paramount in combating prolonged opioid use/misuse. In comparison to older techniques such as the ESP and TPVB block, the PECS II block is not only safer but provides fewer procedural complications. The sustainability of this QI project is being upheld through the accessibility of the protocol for anesthesia staff at the site. To further improve compliance, continual training to the anesthesia staff should be available monthly. Staff should

also be informed of patient results postoperatively in the PACU and post discharge. The site has also been educated on the addition of adjuncts to the PECS II nerve block to prolong duration as well as efficacy. The incorporation of the PECS II nerve block protocol within the facility continues to improve patient outcomes by substantially decreasing pain scores.

References

Al Ja'bari, A., Robertson, M., El-Boghdadly, K., & Albrecht, E. (2019). A randomized controlled trial of the pectoral nerves-2 (PECS-2) block for radical mastectomy. *Anaesthesia*, *74*(10), 1277–1281. https://doi.org/10.1111/anae.14769

Altıparmak, B., Korkmaz Toker, M., Uysal, A. İ., Turan, M., & Gümüş Demirbilek, S. (2019). Comparison of the effects of modified pectoral nerve block and erector spinae plane block on postoperative opioid consumption and pain scores of patients after radical mastectomy surgery: A prospective, randomized, controlled trial. *Journal of Clinical Anesthesia*, *54*, 61–65. https://doi.org/10.1016/j.jclinane.2018.10.040

Anhøj, J., & Olesen, A. V. (2014). Run charts revisited: A simulation study of run chart rules for detection of non-random variation in Health Care Processes. *PLoS ONE*, *9*(11). https://doi.org/10.1371/journal.pone.0113825

Cogan, J. C., Raghunathan, R. R., Beauchemin, M. P., Accordino, M. K., Elkin, E. B., Melamed, A., Wright, J. D., & Hershman, D. L. (2021). New and persistent controlled substance use among patients undergoing mastectomy and reconstructive surgery. https://doi.org/10.21203/rs.3.rs-387597/v1

Fecho, K., Miller, N. R., Merritt, S. A., Klauber-DeMore, N., Hultman, C. S., & Blau, W. S. (2009). Acute and persistent postoperative pain after breast surgery. *Pain Medicine*, *10*(4), 708–715. https://doi.org/10.1111/j.1526-4637.2009.00611.x

Graham, I. D., Logan, J., Harrison, M. B., Straus, S. E., Tetroe, J., Caswell, W., & Robinson, N. (2006). Lost in knowledge translation: Time for a map? *Journal of Continuing Education*

in the Health Professions, *26*(1), 13–24. https://doi.org/10.1002/chp.47

Grandhi, R. K., Lee, S., & Abd-Elsayed, A. (2017). The Relationship Between Regional Anesthesia and Cancer: A Metaanalysis. *The Ochsner journal*, *17*(4), 345–361.

Helfrich, C. D., Li, Y.-F., Sharp, N. D., & Sales, A. E. (2009). Organizational readiness to change assessment (ORCA): Development of an instrument based on the promoting action on research in Health Services (PARIHS) framework. *Implementation Science*, *4*(1). https://doi.org/10.1186/1748-5908-4-38

Johns Hopkins Evidence-Based Practice Model for Nursing and Health Care Professionals (2022), Appendix D.

Kulhari, S., Bharti, N., Bala, I., Arora, S., & Singh, G. (2016). Efficacy of pectoral nerve block versus thoracic paravertebral block for postoperative analgesia after radical mastectomy: A randomized controlled trial. *British Journal of Anesthesia*, *117*(3), 382–386. https://doi.org/10.1093/bja/aew223

Shen, C., Thornton, J. D., Gu, D., Dodge, D., Zhou, S., He, W., Zhao, H., & Giordano, S. H. (2020). Prolonged opioid use after surgery for early-stage breast cancer. *The Oncologist*, *25*(10). https://doi.org/10.1634/theoncologist.2019-0868

Versyck, B., van Geffen, G.-J., & Van Houwe, P. (2017). Prospective double blind randomized placebo-controlled clinical trial of the pectoral nerves (PECS) block type II. *Journal of Clinical Anesthesia*, *40*, 46–50. https://doi.org/10.1016/j.jclinane.2017.03.054

Yuksel, S. S., Chappell, A. G., Jackson, B. T., Wescott, A. B., & Ellis, M. F. (2022). "Post mastectomy pain syndrome: A systematic review of prevention modalities." *JPRAS Open*, *31*, 32–49. https://doi.org/10.1016/j.jpra.2021.10.009

Appendix A

Citation: Altıparmak, B., Korkmaz Toker, M., Uysal, A. İ., Turan, M., & Gümüş Demirbilek, S. (2019). Comparison of the effects of modified pectoral nerve block and erector spinae plane block on postoperative opioid consumption and pain scores of patients after radical mastectomy surgery: A prospective, randomized, controlled trial. *Journal of Clinical Anesthesia*, *54*, 61–65. https://doi.org/10.1016/j.jclinane.2018.10.040	
Purpose or Hypothesis	The purpose of the study was to compare ultrasound guided PECS block with Erector Spinae plane block and its effect on opioid consumption postoperatively.
Design	Prospective, randomized controlled trial
Sample	**Sampling Technique:** Convenience sampling **Eligible Participants:** Patients with ASA I-II status, ages 18-70, undergoing elective unilateral modified radical mastectomy with axillary node dissection. **Excluded:** Those excluded were the following: coagulation disorders, allergy to local anesthetic, BMI >35 kg/m2, infection at injection site, chronic opioid use, and inability to use PCA. **Accepted:** 40 patients were accepted in the study. **Control:** No control group within study. **Intervention:** PECS block was performed in PECS block group and Erector spinae block (ESP) performed in the erector spine plane block groups. Two patients were lost to follow up in PECS block group. **Power analysis/Achieved:** Fifteen individuals were needed per group assuming a power of 0.90 and alpha error of 0.01. A 20% reduction in tramadol was accepted as clinically significant. **Group Homogeneity**: The following characteristic were similar among both groups: age ($p = 0.229$), weight($p=0.729$), height($p=0.159$), BMI ($p=0.413$), and operation time ($p=0.446$). Homogeneity can be concluded.
Intervention	**Control Protocol:** Not applicable to the study. **Intervention Protocol:** PECS nerve block group utilized linear ultrasound probe to identify the pectoral minor, major, and serratus anterior muscles. The ESP group placed the patients in the lateral decubitus position and utilized a linear ultrasound probe to identify landmarks. **Treatment Fidelity:** A randomized computerized table placed individuals into two separate groups. A blinded anesthesiologist collected postop data in the surgical ward.
Outcomes	**Dependent Variable:** The dependent variable was the total amount of postoperative tramadol consumption within 24hours. **DV Measure:** The dependent variable was measured by whether patients received tramadol or not.

Results	**Statistical Results:** The postoperative tramadol consumption in the PECS group was 132 mg compared to 196 mg in the ESP group. **Conclusions**: Using the PECS block significantly reduced tramadol consumption after radical mastectomy cases.
Level/Rational	Level IA. Rationale: This study was a well-designed RCT with generalizable results.

Citation: Al Ja'bari, A., Robertson, M., El-Boghdadly, K., & Albrecht, E. (2019). A randomized controlled trial of the pectoral nerves-2 (PECS-2) block for radical mastectomy. *Anaesthesia*, *74*(10), 1277–1281. https://doi.org/10.1111/anae.14769	
Purpose or Hypothesis	The hypothesis of the study is the use of the PEC-2 block will reduce the analgesic dose required in patients post radical mastectomy compared to those who do not receive a block.
Design	Prospective, randomized controlled trial
Sample	**Sampling Technique:** Convenience sampling **Eligible Participants:** Adult women 18 years or older, ASA status 1-3, who were scheduled for a unilateral radical mastectomy without regard to axillary node clearance. **Excluded:** Patients were excluded for the following reasons listed: pregnant women, drug allergy to Ropivacaine, coagulopathy, injection site infection, chronic pain, alcohol or drug dependence. **Accepted:** There were 50 accepted patients. **Control Group:** 22 adult women were included. 3 were lost to follow up. **Intervention Group:** 20 adult women were included. 5 were lost to follow up. **Power analysis/Achieved:** For the study, 20 participants in each group were needed to detect a reduction in morphine dosages from15 mg to 10 mg at 24 hours postoperatively. There were 25 individuals recruited for each group to allow for a 25% drop out occurrence. **Group Homogeneity**: There was no significant difference among age, BMI, and weight. Average age in block group was 55 compared to no block (54). BMI in the no block group was 23.8 compared to block group (27.6). The average weight in the block group was 66 kg compared to the no block group (74). Groups were homogenous.
Intervention	**Control Protocol:** Patients in the no block group were given 0.1mg/kg sufentanil, propofol 2-3 mg/kg, rocuronium 0.6mg/kg were used for induction. Propofol 6-10 mg/kg was used to maintain anesthesia. **Intervention Protocol:** Patients in the block group received the same induction dose and maintenance of anesthesia as the no block group. In conjunction, the block group received 20 milliliters of 0.5% ropivacaine between the pectoralis minor and serratus anterior muscles. Ten milliliters of ropivacaine 0.5% was injected between the pectoralis minor and major muscles. **Treatment Fidelity:** Each patient was given the PECS-2 block by an experienced regional anesthetist or a regional anesthesia fellow. Skin was prepped using a chlorhexidine 2% in alcohol 70%. A high frequency linear transducer was placed sagittal below the patient's clavicle. The needle used was a 21 g 50-mm insulated facet tip needle and inserted in plane.
Outcomes	**Dependent Variable:** The main dependent variable for the study was 24-hour postop cumulative morphine dose. **DV Measure:** The primary dependent variable was measured using the visual analogue scale. Morphine was given for pain > 3 or upon direct request via patient.
Results	**Statistical Results:** The Student's t test and Mann Whitney U-test were used. The chi-square test was used for categorical data. A p vale of less than <0.05 was considered statistically significant. **Conclusions:** The PECS-2 block with Ropivacaine 0.5% directly reduced the 24-hour postoperative morphine dose from 8.9 mg to 5.4mg. The 48-hour morphine dose was reduced from 12.5 mg to 6.5 mg. The p value was 0.04 showing a statistically significant difference.
Level/Rational	Level IA. Rationale: It is a well-designed randomized controlled trial among two comparable groups with a treatment/intervention applied. It has consistent results that can be generalizable. The sample size is adequate, and results can be used to make recommendations for this patient population.

Citation: Kulhari, S., Bharti, N., Bala, I., Arora, S., & Singh, G. (2016). Efficacy of pectoral nerve block versus thoracic paravertebral block for postoperative analgesia after radical mastectomy: A randomized controlled trial. *British Journal of Anesthesia*, *117*(3), 382–386. https://doi.org/10.1093/bja/aew223	
Purpose or Hypothesis	The purpose of the study was to compare the efficacy of the PecS II nerve block with the thoracic paravertebral nerve block for postoperative analgesia in modified radical mastectomy patients.
Design	The design was a prospective randomized controlled trial.
Sample	**Sampling Technique:** Convenience sampling **Eligible Participants:** Patients ASA I-III, 18-65 years old, undergoing modified radical mastectomy. **Excluded:** Patients were excluded for the following reasons: infection at block site, coagulopathy, morbid obesity (BMI >40 kg), allergy to local anesthetics, decreased pulmonary reserve, major cardiac disorders, renal dysfunction, pre-existing neurological deficits, and psychiatric illness were all excluded. **Accepted:** There were forty female ASA I-III patients accepted. **Control:** There were 20 female patients. Zero were lost in follow up period. **Intervention:** There were 20 female patients. Zero were lost in follow up period. **Power analysis/Achieved:** A minimum of 18 patients were required to show a significance level of 0.05 and a power of 0.8. This showed a 30% difference in 24-hour postoperative morphine consumption. **Group Homogeneity**: The age, height, weight, ASA status, and duration of surgery among the two groups were not statistically significant. Homogeneity can therefore be implied.
Intervention	**Control Protocol:** Patients in group 1 received the TPVB with 25 mls of 0.5% Ropivacaine before the induction of anesthesia. **Intervention Protocol:** Patients in group 2 received a PecS II block with 25 mls of 0.5% Ropivacaine before the induction of anesthesia. **Treatment Fidelity:** Each group received 25 ml's of 0.5% Ropivacaine. Both blocks for each group were performed in the preoperative room 30 mins before surgery. The anesthetist performing the blocks were not a part of the preoperative or postoperative assessment of the mastectomy patient as well as the anesthetic management.
Outcomes	**Dependent Variable:** The main dependent variable for this study was the amount of time to first rescue analgesia after administration of the block and total analgesic consumption in 24 hours postoperatively. **DV Measure:** Postoperative pain was assessed using visual analog scale (VAS) with 0 being no pain and 10 being the worst imaginable pain.
Results	**Statistical Results:** Pain scores, first rescue dose of analgesia, and 24-hour morphine consumption was compared using Mann-Whitney U test **Conclusions**: The duration of analgesia was statistically significant with PecS- II group having a longer period of 52.76 mins of analgesia compared to the TPBV group (31.35 mins). The total 24-hour morphine consumption was also less in the PecS II group with a mean of (3.9 mg) compared to the TPVB group (5.3 mg).
Level/Rational	Level IA. Rational: It is a well-designed randomized controlled trial. The results are generalizable, with a sufficient sample size.

Citation: Versyck, B., van Geffen, G.-J., & Van Houwe, P. (2017). Prospective double blind randomized placebo-controlled clinical trial of the pectoral nerves (PECS) block type II. *Journal of Clinical Anesthesia*, *40*, 46–50. https://doi.org/10.1016/j.jclinane.2017.03.054	
Purpose or Hypothesis	The purpose of this study was to prove whether adding Pecs II nerve block during breast surgery reduced opioid consumption.
Design	Prospective randomized double-blind placebo-controlled study.
Sample	**Sampling Technique:** Convenience sampling **Eligible Participants:** Eligible patients consisted of ASA I-III adult female patients between 18-80 years of age. **Excluded:** Patients were excluded for the following reasons: prior breast surgery, contraindications to regional anesthesia (coagulopathy, abnormal anatomy, inflammatory breast cancer), history of allergy to local anesthetics, chronic use of pain medication, obesity, BMI> 30 kg. **Accepted:** There were 140 enrolled patients in the trial. **Control:** There were 70 patients in the control group. 30 were lost to follow up. **Intervention:** There were 70 patients in the PecS-II group. 25 were lost to follow up. **Power analysis/Achieved:** A sample size of 85 patients provided an 80% power at a two-sided alpha level of 0.05. A two tailed t-test was used to assess the difference between two independent means among the two groups. **Group Homogeneity**: The following characteristics were statistically insignificant among both groups: length (p=0.964), weight(p=0.881), age (p=0.936), length of surgery (p=0.923).
Intervention	**Control Protocol:** Using a linear transducer, a 45-degree short bevel needle, was used to inject 10mls of saline between the pectoralis muscles and 20 milliliters of saline under the pectoralis minor muscle and above the serratus anterior muscle. **Intervention Protocol:** Using a linear transducer, 10 milliliters of levobupivacaine 0.25% was injected between the pectoral muscles and 20ml under the pectoralis minor muscles and above the serratus anterior muscles. **Treatment Fidelity:** Each group was predetermined using a computer-generated randomization schedule. One nurse had access to both Group 1 and Group 2, and prepared identical syringes with levobupivacaine 0.25% or Sodium Chloride in separate rooms. Syringes were then transferred to the operating suite once patient was anesthetized. All nerve blocks were performed by the attending anesthesiologist who were skilled in this nerve block.
Outcomes	**Dependent Variable:** The dependent variable was postoperative opioid consumption and pain scores **DV Measure:** The dependent variables were measured using the Numeric Rating Scale (NRS) and postoperative opioid consumption.
Results	**Statistical Results:** Patients in the Pecs group required significantly less postoperative opioids (p=0.037). Patients in the Pecs group also experienced significantly less pain than the placebo group (p=0.048). **Conclusions**: The Pecs block reduced postoperative opioid consumption in the PACU.
Level/Rational	Level IA. Rationale: The study is a well-designed randomized controlled trial with two comparable groups. Results are generalizable.

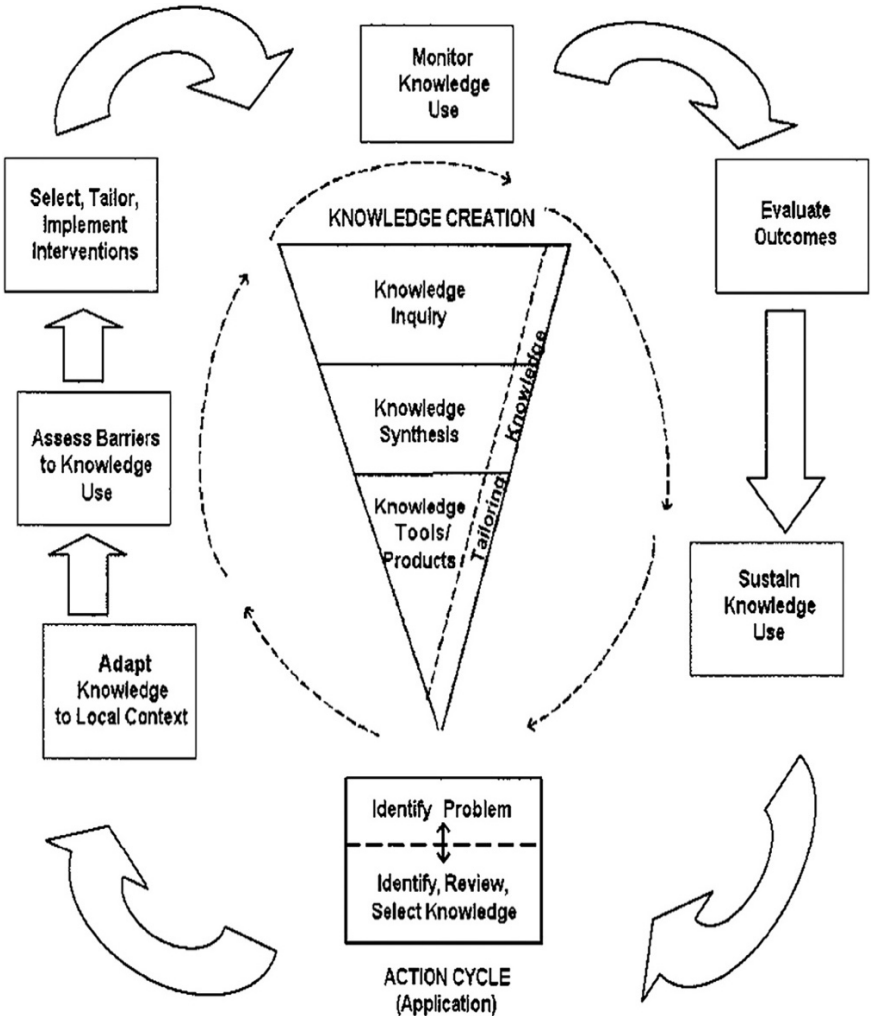
Category (Level Type)	Total Number of Sources/Level	Overall Quality Rating	Synthesis of Findings
Level 1 - Experimental study · Randomized Controlled Trial (RCT) · Systematic review of RCTs with or without meta-analysis	3 Single Blinded RCT's 1 Double Blinded RCT	A	Al Jabari et al., concluded that there was a reduction in morphine dosage in the 24-48 hour postoperative period when incorporating the PECS 2 block.. Kulhari et al.'s study stated there was a 30% reduction in morphine usage in the PECS group. Versyck et al.'s study proved a statistically significant reduction in opioid use postoperatively with a p value of 0.037 when comparing the PECS group to the placebo group. Lastly, Altıparmak's study showed a statistically significant reduction (p=0.001) in tramadol usage when comparing those who received a PECS block versus ESP block. Each study showed a significant reduction in narcotic dosages. Kulhari et al's study and Altıparmak's et al's both compared the Pecs II block to older techniques. The Pecs II block proved to be superior in efficacy of pain management and safety.
Level II · Quasi-experimental studies · Systematic review of a combination of RCTs and quasi-experimental studies, or quasi-experimental studies only, with or without meta-analysis			
Level III · Non-experimental study · Systematic review of a combination of RCTs, quasi-experimental, and non-experimental studies, or non-experimental studies only, with or without meta-analysis · Qualitative study or systematic review of qualitative studies with or without meta-synthesis			
Level IV · Opinion of respected authorities and/or reports of nationally recognized expert committees/consensus panels based on scientific evidence			
Level V · Evidence obtained from literature reviews, quality improvement, program evaluation, financial evaluation, or case reports · Opinion of nationally recognized expert(s) based on experiential evidence			
Recommendations Based on Evidence Synthesis: There is strong evidence that supports performing the PECS 2 nerve block reduces narcotic consumption within the 24-48 hr postoperative period in patients who underwent a radical mastectomy.			

Table 1

Patient Pain Scores in PACU	N
Total Eligible Patients	**24**
PECS II Nerve Block Performed	
PACU pain scores at 15 mins < 5	**12**
PACU pain scores at 30 mins < 5	**11**
PACU pain scores at 1 hour < 5	**11**
PACU pain scores at 2 hours< 5	**11**
PACU pain scores at discharge< 5	**11**
PECS II Nerve Block Not Performed	
PACU pain scores at 15 mins < 5	**7**
PACU pain scores at 30 mins < 5	**3**
PACU pain scores at 1 hour < 5	**2**
PACU pain scores at 2 hours< 5	**4**
PACU pain scores at discharge< 5	**3**

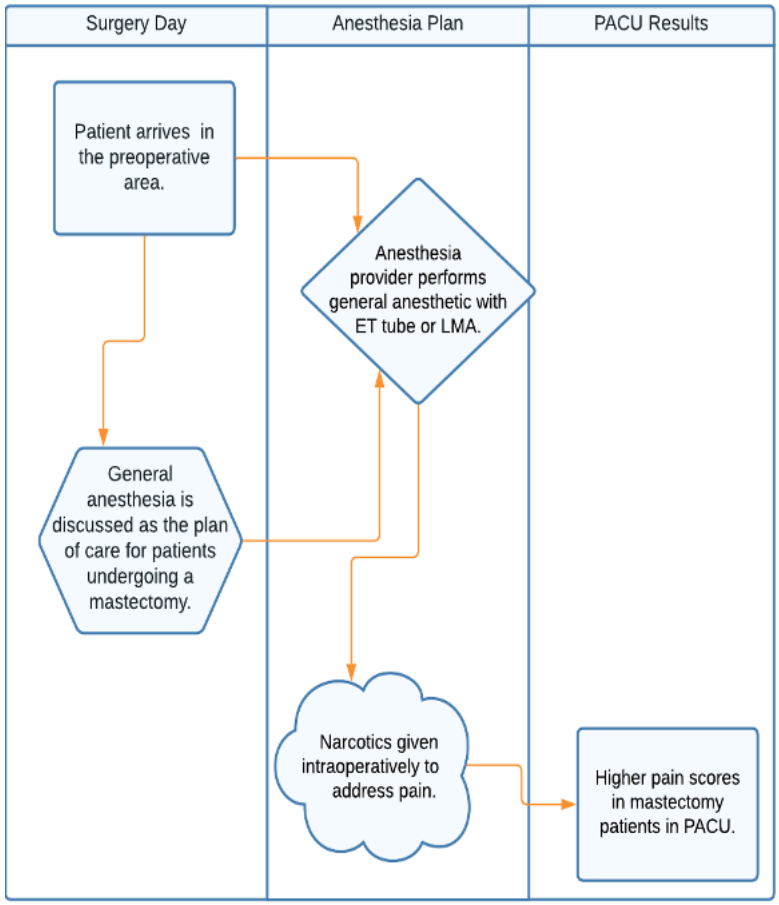
Note. Table displaying pain scores in the PACU.

Figure 1
KTA Framework



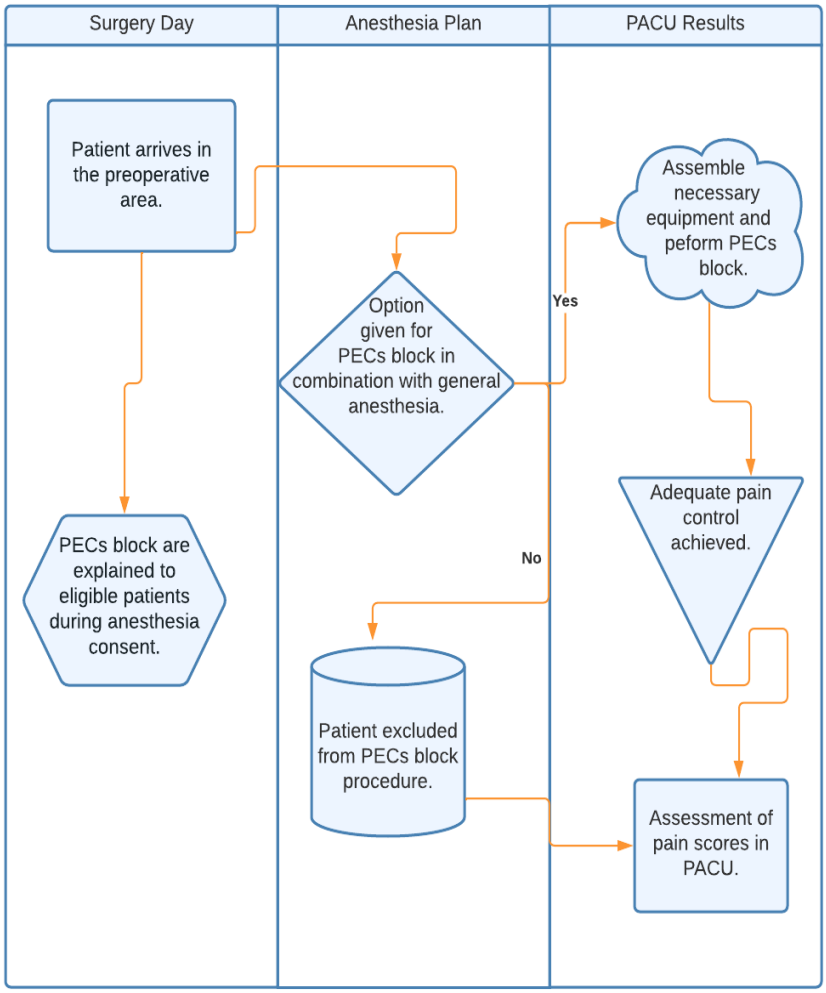
Note. Graham et al.,(2006) KTA framework.

Figure 2
Initial Process



Note. Initial process map at the site for mastectomy cases.

Figure 3
Current Process



Note. *Current process map incorporating Pecs II nerve blocks for mastectomy patients*.

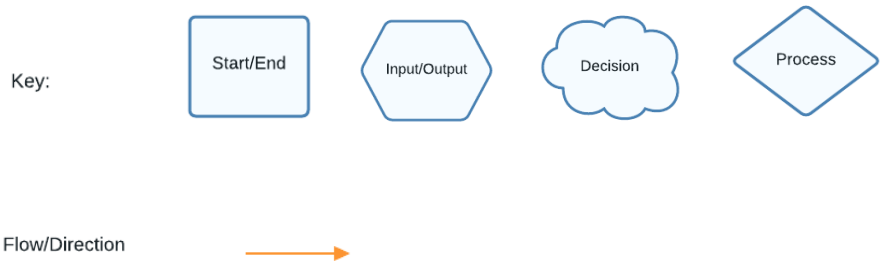
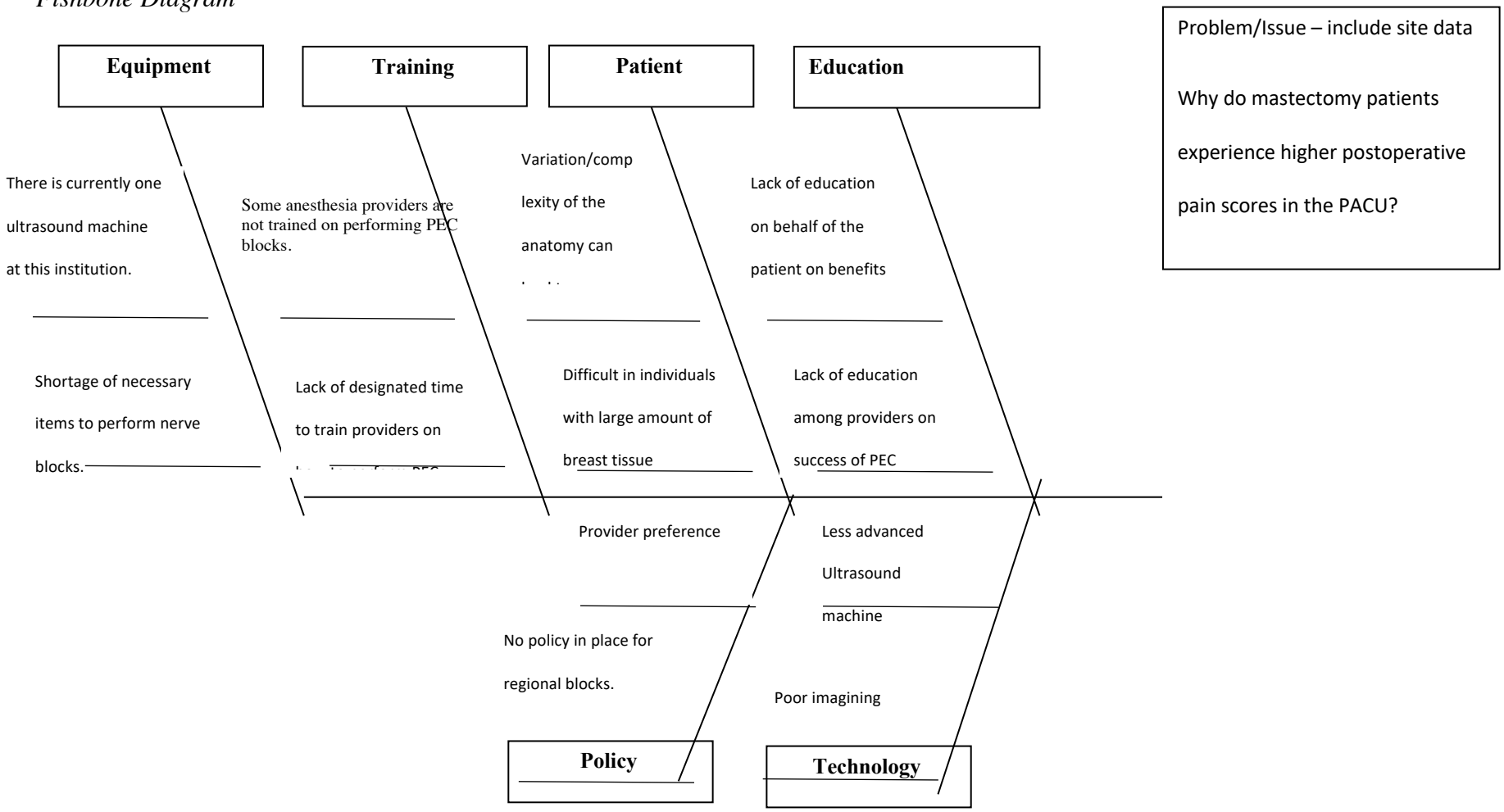


Figure 4

Fishbone Diagram



Note. *Root cause analysis identifying contextual factors*.

Figure 5

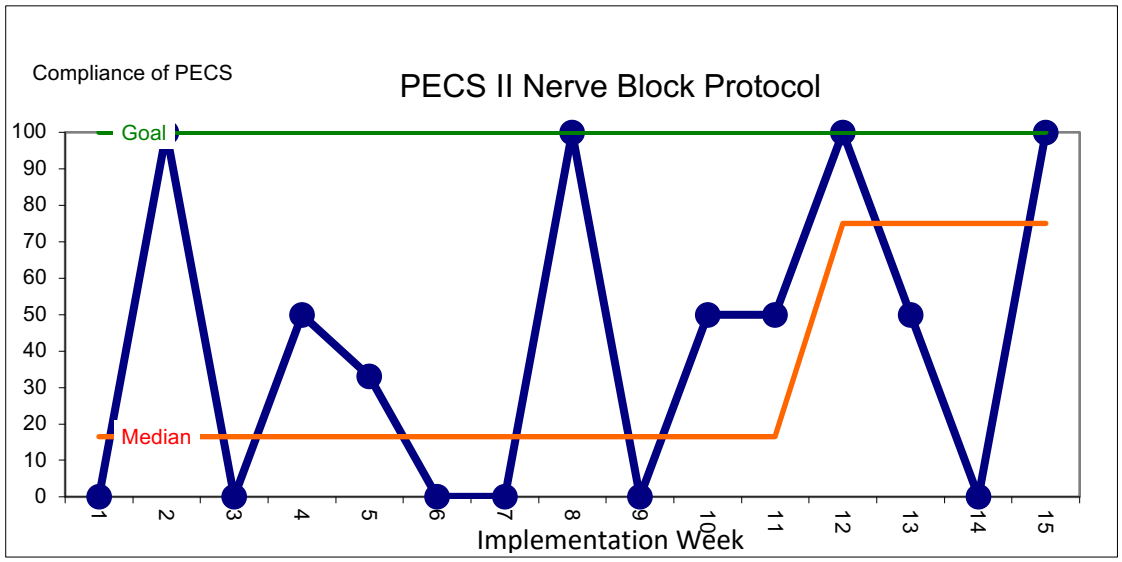
PECS II Note.

Patient Criteria	Patients 18 years and up undergoing mastectomy. **Exclusion:** Those with local anesthetic allergy, chronic pain, coagulopathy, and infection at injection sites.	
Performing the Block	**PECS I**- To complete this block the ultrasound should be placed at the level of the third rib on the anterior chest wall. 10 ml of injectate is used for this plane. **PECS II**- To complete this block the ultrasound is placed at the level of the fourth rib. Local anesthetic (20 ml's) is injected between the pecs minor and serratus anterior muscle.	
Local Anesthetic Choice and Adjuncts	**Local Anesthetic**- Ropivacaine 0.25%. **Adjuncts**- 4 mg Decadron	
Follow-up	Following surgery, in the postoperative phase follow up on patients. See firsthand the results of the PECS II block.	

Note. Protocol for PECS II nerve block

Figure 6

Run Chart



Note. *Run chart displaying compliance with the protocol for weeks one through fifteen.*