The Use of Liposomal Bupivacaine in Interscalene Nerve Blocks

Kirby Begley  
*University of Pennsylvania*, begleyk@nursing.upenn.edu

Alyssa Aboff  
*University of Pennsylvania*, aboff@nursing.upenn.edu

Dilnoza Nasritdinova  
*University of Pennsylvania*, dilnoza@nursing.upenn.edu

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Abstract
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Keywords
"liposomal bupivacaine, interscalene block, total shoulder arthroscopy"

Disciplines
Nursing

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Alyssa Aboff, BSN, RN, CCRN, Kirby Begley, BSN, RN, CCRN, and Dilnoza Nasritdinova BSN, RN, CCRN

School of Nursing, University of Pennsylvania
Abstract

This paper outlines an educational research project at an urban hospital concerning the standardization of the use of liposomal bupivacaine (LB) for an interscalene block (ISB). The PICOT question guiding this project was: In adult surgical patients (P), how does the use of LB for shoulder peripheral nerve blocks, (I) compared to the administration of plain bupivacaine (PB) for shoulder peripheral nerve blocks, (C) affect postoperative pain scores (O) within 48 hours after surgery (T)? Using the numerical rating scale (NRS) for pain, a validated and reliable tool, patients who received LB had their 48-hour pain scores measured and compared to those patients who received PB. Satisfaction scores at 48 hours, a secondary project outcome, were assessed using a single question with a response scale of agree very much – disagree very much. Data was collected over a period of four weeks in those who were appropriate for the project. Data was collected by telephone and recorded on a data collection tool. Both PB and LB had the same mean immediate postoperative pain score (mean = 0.57), however, the mean 48-hour postoperative pain score was lower for those who received LB (mean = 3.29) compared to those who received PB (mean = 6.86). Patients who received LB were more satisfied with their anesthetic care (100% agree very much) compared to those who received PB (57.14% agree very much). From this data, it was concluded that LB provides a superior postoperative analgesic and surgical experience in comparison to PB.

*Keywords*: liposomal bupivacaine, interscalene block, total shoulder arthroscopy
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Pain control after shoulder surgery is vital to facilitating rehabilitation as well as improving patient satisfaction with their surgical experience. The volume of total shoulder arthroplasty procedures in the United States has rapidly increased. From 2002 to 2011, the volume of this surgery performed increased by 66%; in 2011 alone, there were 66,485 patients in the United States who underwent shoulder arthroplasty procedures (Westermann et al., 2015). Regional anesthesia utilizing peripheral nerve blockade via an interscalene brachial plexus block serves as a proven method both to reduce opioid use and to enhance pain control. An ISB may be performed as a single-shot injection of local anesthetic, with or without LB, or a nerve catheter may be threaded into the area to provide continuous analgesia. LB, also known as EXPAREL, was first approved by the Food and Drug Administration (FDA) in 2011 to provide long-lasting pain control for patients undergoing surgery (Golf et. al., 2011). With the advent of Enhanced Recovery after Surgery (ERAS) protocols being implemented across hospitals in the United States, LB can serve as a cornerstone in the pain management of these patients.

Background and Significance

ERAS protocols have become a way to provide patients with a standardized approach to their care while providing them with treatment that is evidence-based. Multimodal analgesia, including regional anesthesia, reduces the need for general anesthesia, increases postoperative recovery and decreases pain (Fleisher, 2018). With the increasing prevalence of shoulder surgeries performed each year, both patients and hospital systems can benefit from this standardization of care. At the hospital, both total shoulder arthroscopy and total shoulder arthroplasty patients receive a multitude of different approaches to their care regarding regional anesthetics. Currently,
ISBs using either PB or LB are being performed, either by means of a single-shot injection of the local anesthetic or with the use of a peripheral nerve catheter. LB use in an ISB has been proven effective in providing long-lasting pain control for those patients who undergo a total shoulder arthroplasty. Patel et al., (2019) found that brachial plexus blocks with LB improved analgesia and decreased opioid consumption in patients, compared to patients who received PB for brachial plexus blocks. LB has been used in a multitude of surgeries with positive effects. Malik and colleagues (2016) found that LB resulted in lower pain scores, a decrease in opioid consumption, faster discharge and a reduction in hospital costs in various procedures, including shoulder surgeries.

Poor pain control can delay patient discharge, and as the hospital moves towards implementing ERAS protocols, it is important to keep in mind that ERAS itself aims to reduce hospital length of stay. Implementation of the use of LB in an ISB requires access to the medication via hospital pharmacy, staff and patient education regarding the effects of LB, and organizational support to add this medication to a pharmacy formulary.

**Problem Statement**

An urban hospital, located in Philadelphia, Pennsylvania, is a large teaching hospital with an established orthopedic department. Despite literature demonstrating the effectiveness of LB for pain management, patients scheduled for total shoulder arthroscopy at the hospital currently undergo a multitude of different approaches to peripheral nerve blockade. A cause of this problem is lack of knowledge regarding the efficacy of LB. The PICOT question guiding this project was: In adult surgical patients (P), how does the use of LB for shoulder peripheral nerve blocks, (I) compared to the administration of PB for shoulder peripheral nerve blocks, (C) affect postoperative pain scores (O) within 48 hours after surgery (T)?
Literature Review

Search Strategy

A literature review was conducted to establish the best evidence-based sources for determining the overall effectiveness of LB for an ISB. The database utilized for obtaining articles was the Cumulative Index of Nursing and Allied Health Literature (CINAHL). This database was chosen due to the wealth of articles involving patient care and its focus on the realms of nursing, surgery and anesthesia. Other sources included the New York Society of Regional Anesthesia website (https://www.nysora.com/) and Handbook of Regional Anesthesia for the Military (Buckenmaier, 2009). Using the Medical Subject Headings (MeSH) “NOT hip, NOT knee, NOT ankle”, the search narrowed to those studies pertaining to upper extremities and thoracic surgeries. When entering the search into CINAHL both “Bupivacaine” AND “peripheral nerve block” were used to yield 816 studies with a publication date from 2015-2020. Expanders included: apply related words & also search within the full text of the articles. The search was narrowed by selecting United States of America (USA) and English, which reached 472 studies. Furthermore, the search results were narrowed by applying major heading criteria: postoperative pain; pain management; shoulder, to yield 148 studies. From this, 130 full-text articles were excluded if they did not specifically assess patient postoperative pain or if they did not address the target anatomical region.

Search Procedure

One hundred forty eight records were screened in order to determine eligibility for use in further evaluation. Articles were excluded in this process if the study evaluated different types of peripheral nerve blocks, such as femoral blocks, and if the study included data from various surgeries, like hip, knee and ankle procedures. Articles that were not available as full-text were
also excluded. Key variables that were tracked included postoperative pain scores with the administration of LB when compared to the use of PB for an ISB, as well as the efficacy and duration of anesthesia when given LB, whether in a single-shot peripheral nerve block or as a continuous infusion.

**Appraisal Procedures**

Once the set of articles and resources relevant to the topic of interest were identified for the review, the information was appraised by determining study designs and study qualities of what the results of the studies were, and whether the data was pertinent to the patient population of interest. The Johns Hopkins Evidence Level and Quality Guide was the tool used to grade and to evaluate the quality of evidence presented in each article, and the evidence was given a score from Level I – VI (Dearholt et al., 2018). To further distinguish the quality of evidence, the Johns Hopkins Tool references a grading scale from high quality (A), good quality (B), and low quality (C), that was also used to evaluate the research compiled for the review.

**Summary of Evidence**

The literature review revealed various findings as they pertain to LB and its efficacy in post-shoulder surgery pain management. The primary finding and goal was to review literature that addressed the pain levels of shoulder surgery patients who received LB compared to those patients who received another type of pain modality. As described in the evidence table (see Appendix A, Table 1), according to Patel et al., (2019) patients who received brachial plexus blocks with LB had improved analgesia and decreased opioid consumption more significantly compared to patients who received PB alone for brachial plexus blocks. Similarly, Vandepitte (2017) showed that even the highest pain score reported in patients given the combination of LB and PB, was still lower than the highest pain score acknowledged in those patients given PB alone.
Wang and Zhang (2017) concluded that LB had comparative effectiveness to an interscalene catheter (ICS) on reducing pain scores and opioid consumption. Namdari (2018) concluded that less opioids were consumed in patients who received LB post-shoulder arthroscopy versus those who did not. ICS is one of the methods of analgesia after shoulder arthroscopies, in addition to single-shot local anesthetics. This pain management modality involves the use of indwelling catheters and a continuous infusion of a local anesthetic. Current literature suggests that the use of an LB injection as compared to an indwelling catheter decreases infection risk, decreases the need to follow up, and decreases the need for infusion equipment (Bromberg, 2017).

Studies that compared the use of an ICS to a single-shot injection of PB showed that lower pain scores were observed in patients who received a continuous ISB compared to a single-shot injection block with PB (Malik, 2016). This suggested that a long-acting, continuous method of local anesthetic delivery was an effective way to manage pain and to decrease opioid consumption in postoperative patients. A study by Kenes et al., (2015) indicated no difference in pain outcomes in a continuous ISB versus a single-shot injection of LB. Although this outcome did not confirm the superiority of one pain modality compared to the other, it clarified one principal factor: that LB was as effective as an ICS, minus the side effects, previously mentioned, that were commonly associated with an ICS.

Organizational Assessment

Current organizational assessment shows no clear evidence-based method of pain management for patients undergoing shoulder arthroscopies. Several factors, such as the current focus on reduction of the opioid burden in the discharge period and promotion of early ambulation (which primarily depends on adequate pain management), have demonstrated the importance and utilization of regional anesthesia. As mentioned above, the hospital has no clear guidelines or
protocols that speak to evidence-based pain management modalities. As a growing number of patients in the greater Philadelphia region receive orthopedic surgeries for various injuries, it is important to explore new, evidence-based methods of pain management, such as the utilization of LB. The reduction in opioid prescriptions in the post-surgical setting would undoubtedly decrease morbidity and mortality associated with opioids and encourage early physical therapy and discharge from inpatient settings. This concern is increasingly important in the post-COVID-19 era, as institutions are working to decrease non-emergent inpatient stays.

Key stakeholders for the implementation of this project included the anesthesia team, both Certified Registered Nurse Anesthetists (CRNAs) and physician anesthesiologists. Dr. Courtney Wells, the anesthesiologist lead for regional anesthesia, was a key stakeholder who was pivotal in implementing the usage of LB. Dr. Jason Pawlosky is a second lead anesthesiologist at the hospital for performing regional anesthetics and was an active stakeholder during the implementation phase by assisting with the administration of the ISBs. Furthermore, the orthopedic team at the hospital, consisting of the surgeons, the residents and the nurse practitioners who managed these patients postoperatively, were included as key stakeholders. Additionally, the perioperative and intraoperative nurses, nurse managers, admissions, and other executive leaders at the hospital were denoted as stakeholders. Pharmacy staff were also included in the list of stakeholders, largely due to the key role they would play with the addition of LB into a pharmacy formulary. LB is approved by the FDA for regional blocks for patients undergoing shoulder surgery, however due to the increased cost of the medication, an organizational buy-in is necessary to add LB to a hospital formulary. Finally, the patients who underwent shoulder surgery and received peripheral nerve blocks held the role as stakeholders during the implementation of the project. Each individual stakeholder provided his or her insights, mobilized resources and actively engaged in the project,
thereby offering a multidimensional and complete approach necessary to provide the most optimal patient-centered care and successful implementation of the project.

**Project Purpose**

The primary purpose of this evidence-based doctoral project was to implement standardization of the use of LB in an ISB for patients undergoing total shoulder arthroscopy. The aim was to bring lasting pain relief to a population of specific surgical patients who historically have had significant postoperative pain. Upper-arm and shoulder surgeries are associated with the highest opioid consumption among upper-extremity procedures (Kim, et al., 2016), and the intention was to provide longer-lasting pain control by providing an analgesic modality that lasted up to 72-hours postoperatively.

**Project Scope**

This scholarly evidence-based doctoral project was designed to improve pain scores for those patients undergoing total shoulder arthroscopy. Patients who received an ISB for procedures other than a shoulder arthroscopy were not included. A convenience sample of 14 patients, seven patients received PB and seven patients received LB, was included in this educational research project. The patients who received PB were those scheduled to undergo shoulder surgery at the hospital, and the patients who received LB were those scheduled to undergo shoulder surgery at the surgical center. The main resources utilized were the vials of LB, the vials of PB, and the Pajunk needles needed by the anesthesia providers to perform the nerve blocks. The anesthesia office was utilized to store the gathered data and to make phone calls for the 48-hour postoperative survey.

**Project Objectives**
The objective of this doctoral project was to decrease postoperative pain scores by implementing the standardized use of LB in an ISB. For this to be accomplished, the hospital and the providers who perform these blocks must use LB more frequently within their practice. To accomplish this end point, the project group educated those physicians who perform these blocks routinely in regard to the literature that supports the usage of LB to decrease both postoperative pain and opiate consumption. This education included a short list of pertinent bullet points from the literature review that supported the usage of LB, as well as visual representations of the project flow chart (see Figure 1) and data collection forms (see Appendix E and Appendix F). A brief summary of the implementation plan was included, with the projected start date of the project, and finally, relative and absolute contraindications for the administration of these blocks. Due to COVID-19 restrictions, the education was delivered by email to the providers, in the form of a PowerPoint, with the project group’s contact information in the case that the providers had follow-up questions regarding the project. With the hope that the results of this project will lead to future standardized use of LB in an ISB, postoperative pain outcomes will continue to be evaluated, as well as patient satisfaction with their anesthetic experience.

**Project Question**

The purpose of this project was to improve postoperative pain scores in patients undergoing total shoulder arthroscopy by utilizing LB; an evidence-based medication that can help decrease narcotic utilization and subsequently improve patient pain scores. The clinical question guiding the goals for this project was, “Does implementing the usage of LB for patients undergoing total shoulder arthroscopy improve their pain scores in the postoperative period?” Secondarily, patient satisfaction was also evaluated.

**Conceptual and Theoretical Framework**
Conceptual Framework

The conceptual model served to guide the process of implementation of the project, which is outlined below. After identifying the problem (pain management in post-shoulder arthroscopy patients) and analyzing the current evidence for the use of LB, the next step was educating healthcare providers who cared for this patient population and tailor the education to their needs. Next, the use of LB was monitored and the outcome of the project was evaluated.

Evidence-based practice is inherent to providing safe and cost-effective health care. The “Iowa Model of Evidence Based Practice to Promote Quality Care” enables healthcare organizations to use a stepwise approach to resolve a clinical issue with an appropriate intervention that is based on evidence-based practice (Iowa Model Collaborative, 2017). The Iowa Model is specifically tailored to help promote excellence in healthcare by using evidence-based practice and is user friendly to most organizational teams. The first step is identifying the opportunities or issues within the system that need improvement. The next step involves establishing whether the clinical problem is localized, organizational or even more universally recognized as an issue. As a team, postoperative pain management for the patient population undergoing shoulder surgeries was clinically identified as an issue that was not only organizational (as it related to the hospital), but also as one that could affect state and national initiatives, and policies specific to pain management. No specific accrediting agency or regulations needed to approve the use of LB for the project, since it is an FDA approved medication that is prescribed and is administered to patients for pain, including at the hospital. The interest in this topic presented at a time when there was a national push to decrease the societal opioid burden and to decrease the mortality associated with opioids. The “philosophy of care”, as stated in the Iowa Model, is to alleviate patients’ pain and to expedite
the speed of recovery, while decreasing adverse events associated with surgeries (via early ambulation, physical therapy, multimodal pain management, regional anesthesia, etc.).

The process of implementation began with understanding the needs of the patients who were undergoing shoulder arthroscopies at the hospital and analyzing their preferences as it related to pain management. Emerging evidence shows that there is a heightened risk of prolonged opioid misuse among opioid-naïve patients following common shoulder arthroscopies. Changing the current pain management practice is especially important given the increasing evidence showing the efficacy of LB in managing postoperative pain (see Appendix A, Table 1).

Undoubtedly, the cost and novelty of this medication was a major constraint to using LB. A localized treatment protocol or an evidence-based practice guideline would enable the healthcare providers to implement changes in their practice and to reduce postoperative pain in the studied population. Next, the team implemented the guidelines and evaluated the process and the outcomes. A postoperative evaluation of patients’ pain level was done to assess the patient’s pain level following surgery. As a secondary outcome, an evaluation of the patient’s level of satisfaction, with his or her anesthetic and effectiveness of analgesia, was assessed in the postoperative period. The team analyzed and monitored the implementation strategy and decided since the outcome data showed positive results (as assessed by decreased postoperative pain and heightened patient satisfaction), the results were disseminated accordingly.

**Theoretical Model**

As Good discussed in the Middle Range Theory of Acute Pain Management, individuals who experience the intense discomfort and sensation of pain are likely to have delayed healing and recovery (Good, 1998). Poor pain management for patients, especially during and after shoulder surgery, can prolong hospital length of stay, increase medication and narcotic requirements,
decrease patient satisfaction, and discourage both adequate range of motion and a return to activities of daily living for the patient. The middle range theory of balance between analgesia and side effects is most like the Doctor of Nursing Practice (DNP) project at hand. The overarching phenomenon of the project was to address pain management in surgical patients undergoing shoulder surgery. Specifically, utilizing evidence-based practice to determine the most adequate method of providing an ISB for this patient population, and determining if the use of LB for an ISB was superior to utilizing PB for the block. As seen in Appendix A, Table 1, Evidence of Studies of Liposomal Bupivacaine Effectiveness, the use of LB has decreased the amount of postoperative opioid use in certain patient populations, though more research and data are needed to confirm and to solidify this practice, to create a standardization of care at the hospital.

In agreement with Good’s narrative, there is an increased risk of harmful side effects for patients when their pain is not managed. For example, when patients need to take opioids, they are at an increased risk of “side effects such as nausea, itching, and drowsiness” (Good, p.120, 1998). Good highlights the necessity of this theory in that the balance between effective pain management and analgesia is imperative for patient safety and “important for ethical, humanitarian, and economic reasons” (Good, p.123, 1998). The theoretical model equates to the DNP project with its three main components: multimodal intervention, attentive care, patient participation. After an integrative review of the current research with the use of LB for an ISB for adult patients undergoing shoulder surgery, studies have shown positive effects for patients regarding a decrease in opioid use postoperatively for pain management, and an increase in satisfaction scores. Both attentive care and patient participation were pursued during the implementation of the DNP project, with the use of careful patient assessments, from the preoperative period through the postoperative period, as well as postoperative follow-up surveys. Assessment of the patient’s pain
status was key to determining the effectiveness of LB, as well as the review of the 48-hour follow-up surveys to determine satisfaction with the anesthetic received.

This theoretical model provided the conceptual basis for the clinical problem, that was adequate pain management for adult patients undergoing shoulder surgery, and provided the basis and rationales for the intervention used during the implementation of the DNP project.

**Methods**

**Setting**

In order to successfully collect an adequate amount of data, two facilities were utilized for the implementation of the project. The first setting for the project was an urban hospital, specifically the preoperative unit where the orthopedic patients stay before surgery as this was where the nerve blocks were performed. The nerve blocks are rarely performed after induction of general anesthesia, so the operating room environment was not included in the project’s setting. The hospital is an academic-affiliated tertiary medical center which includes a 16-bed preoperative unit, in addition to a six-bed regional block preoperative area; both of these sections are staffed by preoperative nurses. Nerve blocks are primarily conducted in the regional block preoperative section by the attending anesthesiologists after the patient is placed on standard monitors (to assess pulse oximetry, blood pressure and heart rate) and given supplemental oxygen. Patients scheduled to undergo shoulder arthroscopy at the hospital were included in the project as those patients who received PB in an ISB.

The second setting included in the project was a smaller, outpatient surgical center, located a few miles away from the hospital, that cared for a comparable patient population. Similar to the hospital, the nerve blocks are typically performed in the regional block preoperative section by the attending anesthesiologists. Patients that were scheduled to undergo
shoulder arthroscopy at the surgical center were included in the project as those patients who received LB in an ISB.

**Participants**

Participants included in the implementation of the project were those patients, admitted to either the hospital or the surgical center, scheduled to undergo shoulder surgery. To have been eligible for the project, participants needed to meet the criteria that they are between ages 20 – 75 years old and have no significant co-morbidities that preclude them from undergoing a regional anesthetic, i.e., severe aortic or mitral stenosis, infection at the site or profound coagulation issues.

Once participants were identified to fit the inclusion criteria, the first seven consecutive participants scheduled to undergo shoulder surgery at the hospital received PB in the ISB. The same selection criteria was utilized at the surgical center to identify the first seven consecutive and eligible participants, who received LB in the ISB.

At the hospital, there are roughly eight shoulder arthroscopies performed on a weekly basis. Comparatively, there is the same number of shoulder arthroscopies performed each week at the surgical center. Since the surgical center has an abundant supply of LB, an ISB is typically performed with the administration of LB for patients scheduled for shoulder arthroscopy.

**Intervention**

The intervention, a follow-up survey to determine if LB was superior to PB in an ISB, was guided by the conceptual and theoretical frameworks previously described. The implementation team assessed each patient for pain in the immediate postoperative period, followed by a phone call 48 hours post-surgery to evaluate both the level of pain, using the same numerical rating scale (NRS) for pain, as well as satisfaction with the anesthetic received. Responses from the patient were recorded on a patient specific case report form (see Appendix F), which served as the data
collection tool for the entirety of the implementation of the project. After the completion of the intervention period, data was analyzed to compare pain score outcomes (mean ratings) between the two groups, the LB group and the PB group.

**Project Implementation Plan**

The implementation strategy for this project was multifaceted and involved various steps that included healthcare providers, clinical leads, and key stakeholders within the hospital. As part of the implementation plan, the advantages and the anticipated impact of LB was highlighted in the education PowerPoint that was provided to the healthcare providers. To create interest and awareness, the PowerPoint provided key findings of studies that showed the efficacy of LB and was distributed by email to the anesthesia team members partaking in the project, as well as to the nurses in the Post Anesthesia Care Unit (PACU), one month prior to implementation of the project.

While in the preoperative period, eligible patients were identified if they met specific criteria for regional blockade by the anesthesia team (as specified per American Society of Anesthesiologists guidelines) and met the DNP project specific inclusion criteria (see Figure 1). Patients were consented for regional anesthesia and educated on its risks and benefits. After being identified, seven eligible patients received an ISB with PB at the hospital. During the same implementation period, an additional seven eligible patients received an ISB with LB at the surgical center. Patients were transported to the operating room, where report was given to the OR nurse and the anesthesia team about the ISB, and the patient’s participation in the project.

Patients selected for the LB and PB nerve block received standard anesthesia as decided per the surgery and anesthesia teams. Involving leadership has shown to create a long-lasting impact on adaptation and sustained use of evidence-based practice interventions (Cullen,
During the active phase of the implementation plan, healthcare providers were assisted by the DNP project team members during the procedures where either PB or LB was used.

In the postoperative period, patients were transported to the PACU and report was given to the PACU nurse about the patient’s regional anesthesia. The anesthesia team performed a postoperative evaluation of the patient’s pain level based on the NRS for pain. This pain level was recorded in both the patient’s electronic health record (EHR) and the case report form (see Appendix F) and abstracted as an outcome for this project.

On completion of 48-hours of postoperative status, a student registered nurse anesthetist (SRNA) from the project team contacted the patient by phone to assess the patient’s pain and satisfaction level, and this information was entered on the patient’s case report form. Follow-up phone calls were already a standard of practice at both the hospital and the surgical center, and were usually done by the anesthesiologist who performed the peripheral nerve block, or by a designated nurse liaison in the PACU, to ensure a patients’ understanding of his or her discharge instructions. The same NRS for pain that was used in the immediate postoperative period was used during the call to determine the patient’s current pain level. Additionally, the project team asked a single question regarding his or her satisfaction with the anesthetic received (see Appendix E). The data collected from both the immediate postoperative period and the follow-up phone calls was recorded on the patient specific case report form (see Appendix F), which followed the patient during the entirety of the project. Participation in this project was continuously encouraged by requesting feedback on positive or negative results and experiences by the anesthesia providers, by means of informal discussions during bi-weekly meetings either by a phone call or in person at the hospital. The project implementation team provided the anesthesia
providers with updates on the patient experiences with the usage of either LB or PB in the form of email.

**Measures**

**Pain**

Postoperative pain was the outcome of the project; pain was measured using the NRS for pain (see Appendix E). The NRS requires the patient to rate his or her pain on a defined scale of 0–10, where 0 is no pain and 10 is the worst pain imaginable. This scale is familiar to patients and allows for data to be measured as a continuous variable. The NRS takes less than a minute to administer and to score, and serves as a valid scale to measure pain. The NRS has been used in previous LB implementation projects to assess the patient’s pain after an ISB with LB (Maalouf, 2016). The NRS has been found to have excellent reliability for the measurement of musculoskeletal pain (Alghadir et al., 2018). In patients with chronic pain conditions, the NRS has been shown to be accurate and to correlate with visual analog scales of pain; correlations ranged from 0.86 to 0.95 (Hawker et al., 2011). During the implementation of this project, patients were asked to utilize the NRS for pain in both the immediate postoperative period and during the follow-up phone call 48-hours postoperatively.

**Patient Characteristics**

Patient age, gender, body mass index (BMI) and race were extracted from the EHR, in addition to the anesthetic modality received (LB or PB).

**Patient Satisfaction with Anesthesia**

Numerous patient satisfaction scoring systems exist in the anesthesia literature, however, a recent systematic review revealed that although specific satisfaction assessment scales lack reliability, there is an overall lack of standardized, reliable and valid questionnaires to assess
satisfaction among patients undergoing anesthesia (Pratamaporn, 2009). A single statement, “I was satisfied with my anesthetic care”, with responses 1, 2, 3, 4, 5 and 6 (where 1= disagree very much, 2 = disagree moderately, 3= disagree slightly, 4= agree slightly, 5= agree moderately, 6= agree very much) was asked during the follow-up phone calls to assess patient satisfaction with anesthesia.

**Data Management Plan**

**Data Collection**

The outcome data for this project comprised of the postoperative pain and satisfaction scores reported from the patients who were included in the project. Pain scores were evaluated in the PACU according to the NRS for pain, and both satisfaction and pain scores were collected 48 hours after surgery during a phone call with the patient. This data was collected for both LB and PB groups; pain scores were evaluated as soon as the patient could score his or her pain level prior to discharge from the PACU, which was clinically recorded on the patient specific case report form (see Appendix F). After 48 hours post-surgery, members of the project team contacted patients by phone to assess the level of pain, using the same NRS utilized in the immediate postoperative period, and to determine patient satisfaction, and the data was recorded on the same patient specific case report form (see Appendix F).

The phone calls were made by the project leaders from the hospital’s anesthesia office 48 hours following surgery. After obtaining verbal permission from the patient, patient contact numbers were taken from the EHR. The data received during these phone calls, as well as the immediate postoperative pain scores in the PACU, was recorded on a patient specific case report form (see Appendix F). These case report forms served as the data collection tool for project implementation. If the team leaders were unable to reach the patient, a voicemail was left with a
designated return phone number, and the case report form was marked as having received a call and flagged for the missing data values. The compiled data was securely maintained in the anesthesia office at the hospital, accessible to only the project team members. The team ensured the feasibility of these steps during the pilot project phase prior to implementing the project.

**Data Maintenance and Transfer**

As the data was collected, project leaders monitored the process on a weekly basis, while concurrently reviewing the data from the previous week. Data transfer from the project data collection tool (patient specific case reports forms) to a project database was implemented at the hospital’s medical library into two separate Microsoft Excel 2019 files, completed by two separate project leaders, and compared for discrepancies by a third project leader. Following this step, the data was entered into the created Research Electronic Data Capture (REDCap) instrument (version 1), which ensured ease of data transfer for final analysis. Any discrepancies were resolved by the third project leader, who would access the EHR and case report forms (source data) in order to correct any erroneous entries.

Before the data transfer step was initiated, patient specific case report forms were verified and assessed for missing data, extreme values, and ineligible entries; any corrections made to the patient specific case report forms were done by one SRNA and were submitted to the project leader for review at the hospital. Missing data on case report forms was obtained by a designated SRNA using the patient’s EHR at the hospital. The REDCap data collection instrument had an embedded feature that required a data point to be entered for each question, which served as an additional checkpoint and verification step to avoid missing values. The finalized and completed database was password protected.
Data analysis was performed by all project members, using Microsoft Excel 2019. Prior to importing data from both the Microsoft Excel 2019 database and REDCap instrument into the final Microsoft Excel 2019 spreadsheet, a codebook was created utilizing REDCap version 1 software in order to provide a more comprehensive understanding of the data set. After a final review of the data, to evaluate for omissions or extreme values, in Microsoft Excel 2019, statistical analysis was conducted.

**Analysis**

To better understand and to describe the effect of LB versus the effect of PB in this patient population, the group determined the relationships between the type of local anesthetic (LB and PB) and the outcomes of pain and satisfaction scores, as well as whether any statistically significant differences existed between the LB group and the PB group.

**Descriptive Analysis**

Due to the small sample size (N=14), the group evaluated the dependent variables via descriptive statistics by measures of central tendency with mean and median for pain and satisfaction scores; median scores were prioritized in the descriptive analysis to determine the value positioned in the middle of the dataset (Landgren, 2008). This method was utilized primarily due to the small sample size, absence of a normal distribution, and outliers in the data that were present. Patient characteristic variables included age (20 to 75 years), sex (Male, Female, Undisclosed), race (American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, White, and Some Other Race) and BMI (Below 18.5, 18.5 to 24.9, 25 to 29.9, 30.0 and Above). Statistical and visual variability of the data by bar charts were used. Bar charts were utilized to visually evaluate the differences in pain and satisfaction scores between the PB group and the LB group.
Ethical Considerations

The Institutional Review Board (IRB) of the University of Pennsylvania determined that the project qualified as educational research, or exempt category 1 (see Appendix G). Patient consent was always collected prior to receiving an anesthetic. Consent for the participation in the implementation of the project was not required, as the implementation only involved a postoperative survey to determine the patient’s pain level and satisfaction with the anesthetic. The patients included in the project were not exposed to any experimental treatment nor withheld treatment, and the educational research project did not impact the patient’s clinical care. During the follow-up phone call, an IRB-approved script was utilized by the project leaders to conduct the survey, and consisted of a statement that the study involved educational research, description about the study procedures, statement that the research was voluntary, and information about whom to contact with any questions.

The ethical risks addressed included those of threats to patients’ privacy, due to the nature of the survey and the data obtained in the patient specific case report forms. In order to mitigate the risk of patient confidentiality, patient specific case report forms were securely maintained in a lockbox located in the anesthesia office at the hospital, accessible only to project team members. The 48-hour follow-up phone calls were conducted solely in the anesthesia office at the hospital, in order to protect patient privacy and to avoid discussing patient information in other environments. After completion of data transfer and data management in a secured, password-protected database, accessible only to project team members, patient specific case report forms were disposed of in hospital designated and Health Insurance Portability and Accountability Act (HIPPA) approved shredders at the hospital.

Results
After accounting for the initial exclusion criteria, 14 patients received an ISB as part of the anesthesiologists’ clinical management plan prior to undergoing shoulder surgery. Seven patients, who were scheduled to undergo surgery at the surgical center, received LB as their anesthetic modality, and seven patients, who were scheduled to undergo surgery at the hospital, received PB as their anesthetic modality. Two separate bar charts were created in Microsoft Excel 2019 to examine the differences in mean postoperative pain scores by anesthetic group (see Figure 2 and Figure 3). An additional clustered bar chart was created to examine the differences in satisfaction survey responses by anesthetic group (see Figure 4).

As seen in Figure 2, the bar chart displayed the mean immediate postoperative pain scores by anesthetic group, either LB or PB, for a total sample size of N=14. The mean immediate postoperative pain score for the PB group (mean = 0.57) was the same as the mean immediate postoperative pain score for the LB group (mean = 0.57). The PB and the LB group had equal median immediate postoperative pain scores (median = 0). Results illustrated in Figure 3 demonstrate that the mean 48-hour postoperative pain score for the LB group (mean = 3.29) was lower than the mean 48-hour postoperative pain score for the PB group (mean = 6.86). Furthermore, the median 48-hour postoperative pain score for the LB group (median = 2) was lower than the median 48-hour postoperative pain score for the PB group (median = 7).

**Implementation Process Summary**

Just prior to project implementation, various changes occurred from the original project implementation plan to ensure enough data would be gathered for adequate analysis upon completion of the project. The sample size for LB was decreased due to lack of availability of the medication, cost of the medication, and physician hesitancy to use the medication. As such, the number of participants to receive PB was also decreased to allow for equal comparison.
Due to both the limited availability of LB and the abbreviated schedules of the orthopedic surgeons, data collection for those participants who received LB took place at an outpatient, hospital-affiliated surgical center, while data collection for those who received PB remained at the urban hospital. The surgical center, located in Philadelphia, PA, is a multi-specialty care center that performs multiple ambulatory surgeries each day, and cares for a similar patient population that is seen at the hospital. The same anesthesia providers that work at the hospital also frequently provide care at the surgical center, and the orthopedic surgeons involved in this project rotate to both the hospital and the surgical center. Prior to implementation of the project, a thorough site assessment of both locations demonstrated that patient demographics and characteristics were similar at both facilities, thus allowing for alike comparisons of postoperative pain scores and satisfaction with anesthesia for those participants who were included in the project. The decision to collect data at the surgical center, that is only data concerning those patients who received LB, was made after reviewing the limited schedule of the orthopedic surgeons at the hospital and discussing with the pharmacy staff at the hospital about the availability of LB. In order for the group leaders to ensure that data collection for the project could be completed in a timely fashion, and that there were no large gaps in time between reviewing those patients who received PB and LB, both the DNP group leaders and key project stakeholders reached the decision to include two settings for the project.

The IRB of the University of Pennsylvania was contacted, prior to project implementation, regarding the addition of the second site for data collection. Since the project qualified as education research, or exempt category 1, no further modifications or adjustments needed to be made for the project to uphold to IRB approval status (see Appendix G). During the pre-implementation phase, the site survey of the surgical center confirmed that the anesthesia providers who work at the center were also present and employed at the hospital. With the large
quantities of LB available and already in use at the surgical center, staff education regarding the medication was not necessary, and only education regarding the project was delivered at the surgical center prior to project implementation.

**Project Specific PICOT Question Results**

At the start of the DNP project, the aim was to answer the PICOT question, “In adult surgical patients (P), how does the use of LB for shoulder peripheral nerve blocks, (I) compared to the administration of PB for shoulder peripheral nerve blocks, (C) affect postoperative pain scores (O) within 48 hours after surgery (T)?” After analysis of the data, the determination was made that LB provided superior and lasting analgesia in the postoperative period when compared to PB. As evidenced above, the mean 48-hour postoperative pain score in the LB group was lower than the mean 48-hour postoperative pain score in the PB group.

**Secondary Results**

As a secondary outcome, satisfaction scores in the 48-hour postoperative period were compared between the LB group and the PB group (see Figure 4). In response to the statement, “I was satisfied with my anesthetic care”, 100% of the patients in the LB group answered that they Agree Very Much. In response to that same statement, 57.14% of patients in the PB group answered that they Agree Very Much, and the remaining 42.86% of patients in the PB group answered that they Agree Slightly. There were no patients included in the project who responded to the satisfaction survey statement that they Disagree Very Much, Disagree Moderately, and Disagree Slightly.

**Discussion**

**Summary**
After completion of data collection and data analysis, the group found that LB was superior to PB when comparing postoperative pain outcomes. Though both groups had the same mean immediate postoperative pain scores, the mean 48-hour postoperative pain score was lower among those who had received LB compared to those who received PB. Additionally, patients who received LB were more likely to be satisfied with their surgical experience. The PICOT question the group had set out to answer was to determine which anesthetic modality provided greater analgesia after shoulder arthroscopy.

Strengths of the project included the lack of missing data from the analysis, as each patient included in the project was successfully contacted in both the immediate postoperative period and on a phone call 48-hours postoperatively. This allowed the production of data that truly represented each patient’s experience with either LB or PB. Another strength included the statistical analysis, as computing and comparing the measures of central tendency, mean and median allowed the project leaders to clearly delineate between the two groups in terms of satisfaction and pain scores.

A major limitation of this project was the small sample size (N=14). The data collection period under the time constraints of the DNP project schedule allowed the group to collect data solely within a four-week period. Thus, the results within this project were not generalizable to a larger population undergoing shoulder arthroscopy. In addition, sampling of these patients was based on the ease of access the group had to them and how they fit into the group’s selection criteria. A convenience sample is highly vulnerable to selection bias and influences beyond the group’s control. For these reasons, future studies should involve multiple hospital centers to increase the diversity among patients.
Recommendations for future projects analyzing the differences between LB and PB for an ISB include collecting a larger amount of data, by expanding either the sample size or the length of data collection time. If either of these conditions are fulfilled for future projects, the larger quantity of data may yield a more comprehensive analysis and considerable statistical differences between the two anesthetic modalities, thereby offering significant implications for practice.

**Implications for Practice**

LB was shown to be an effective modality to provide long-lasting analgesia to a patient population that has long had pain management issues in the postoperative period. The evidence for the implementation of LB into peripheral nerve blocks is profound and is has been discussed that “adding LB to standard bupivacaine for interscalene brachial plexus blocks lowered patients’ worst pain scores with major shoulder surgery” (Gil, et al., p.1045, 2019). Those patients who received LB in an ISB, specifically at the surgical center, were found to have a less painful and more satisfying perioperative experience. The evidence for the use of LB and the visual representation of the results from the DNP project suggest that the utilization of LB in an ISB should be a standard of care at the hospital, as the medication led to effective pain management and improved quality care that resulted in an enhanced and highly satisfied experience for the patient.

**Sustainability Plan**

Since LB is already in use at the hospital, but is not considered a standard of care for administration in an ISB, positive results from the project serve as rationale to guide the ongoing quality improvement process of managing postoperative pain for patients undergoing shoulder surgery at the hospital.
To ensure that the hospital will standardize the use of LB in an ISB for patients undergoing shoulder surgeries, it will be critical to have the support and the advocacy from the entire anesthesia team utilizing the medication and performing the peripheral nerve block. Ongoing education for the nurses taking care of this patient population, both preoperative and postoperatively, will be necessary to ensure the team is aware of both the effectiveness and the benefits of LB. Postoperative phone calls should be performed for patients that receive LB in an ISB to confirm adequate pain control and patient satisfaction, as well as to report any side effects that could potentially hinder the use of LB. An appropriate cost analysis will need to be conducted that supports the use of LB, such that it decreases the consumption of additional medications as the result from inadequate analgesia and poor pain management. The key stakeholders at the site will need to coordinate and to develop a plan with the surgeons, hospital leaders, and pharmacy personnel, that will equip the hospital with a substantial amount of LB to be utilized for every ISB. With the anticipated hope that LB in an ISB will become a standard of care at the hospital, ongoing education and training, including updated and relevant evidence regarding its use, will be required for those providers who will be in direct patient care of those receiving the medication. Continued monitoring of the use of LB in an ISB for shoulder surgery will take place, and any pertinent findings or changes will be reported to the hospital stakeholders to make any necessary clinical practice adjustments.

**Conclusions**

For those patients scheduled to undergo shoulder arthroscopy, the utilization of LB for the administration of an ISB attenuated postoperative pain, thus providing an enhanced and optimal patient experience with the healthcare facility, as well as with the anesthesia received. Current observed practice at the hospital did not demonstrate a standardization of anesthetics to
be used for those patients undergoing shoulder arthroscopy, as the medications utilized in the ISB were chosen based on anesthesia providers’ clinical decision. This educational research project could help guide implementation of the standardized use of LB in an ISB at any facility that performs shoulder arthroscopy. The next step that would benefit this educational research project would be to administer LB in an ISB to a larger patient population. By implementing LB to a larger population, and continuing to monitor postoperative pain, the benefits, including superior analgesia and enhanced patient satisfaction, of the medication can lead to the creation of a definitive protocol for those patients undergoing shoulder arthroscopy.
References


Figure 1

Process Flow Chart

Note. Process flow chart was created during the pre-implementation phase of the project.
Figure 2

*Immediate Postoperative Pain Scores*

*Note.* Mean immediate postoperative pain scores are shown for patients’ who received LB and PB. Pain scores were extracted from the patients’ response to the NRS for pain in the immediate postoperative period, and the mean pain score was calculated for each anesthetic group.
Figure 3

48-Hour Postoperative Pain Scores

Note. Mean 48-hour postoperative pain scores are shown for patients’ who received LB and PB. Pain scores were extracted from the patients’ response to the NRS for pain during the 48-hour postoperative follow-up phone call, and the mean pain score was calculated for each anesthetic group.
Figure 4

*Patient Satisfaction Survey Responses*

*Note.* Patient responses to the satisfaction with anesthetic care survey are shown for all patients included in the project. Responses were collected during the 48-hour postoperative follow-up phone call, and categorized according to their given response.
# Appendix A

## Table 1

**Evidence Table of Studies on Liposomal Bupivacaine Effectiveness**

<table>
<thead>
<tr>
<th>Study</th>
<th>Primary endpoint</th>
<th>Setting</th>
<th>Study Sample</th>
<th>Design</th>
<th>Intervention (N)</th>
<th>Comparator (N)</th>
<th>Level of Evidence</th>
<th>Primary outcome : (+, - or +/-)</th>
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<td>Post-operative pain scores</td>
<td>Ambulatory surgery center</td>
<td>TSA patients</td>
<td>RCT, prospective double blind study</td>
<td>ISB with 20 mL bupivacaine (n=77)</td>
<td>ISB with 40 mL bupivacaine (n=77)</td>
<td>1A</td>
<td>+/-</td>
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<td>Post-operative pain scores</td>
<td>US hospitals (n=16)</td>
<td>TSA patients</td>
<td>Double blind RCT</td>
<td>LB injection; 133 mg (n=69) 266mg (n=15)</td>
<td>Normal saline injection (n=71)</td>
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<td>Vandepitte, et al. (2017)</td>
<td>Post-operative pain scores</td>
<td>Ambulatory surgery center</td>
<td>TSA patients</td>
<td>Prospective, double blind study</td>
<td>LB with PB (n=26)</td>
<td>PB injection (n=26)</td>
<td>1A</td>
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<td>Malik et al. (2016)</td>
<td>Post-operative pain scores</td>
<td>Ambulatory surgery center</td>
<td>TSA patients</td>
<td>RCT</td>
<td>Continuous ISB (n=43)</td>
<td>Single injection ISB (n=42)</td>
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<tr>
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<td>Single injection with PB (n=39)</td>
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<tr>
<td>Wang, K., &amp; Zhang, H. (2017)</td>
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<td>Ambulatory surgery centers</td>
<td>TSA patients</td>
<td>Meta-analysis</td>
<td>Single injection with LB (n= 199)</td>
<td>ISB with PB (n=311)</td>
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<td>Ambulatory surgery center</td>
<td>Adult surgical patients</td>
<td>Retrospective cohort study</td>
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<td>Continuous infusion of PB (n=262)</td>
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<td>Literature review</td>
<td>Single injection with LB</td>
<td>PNC</td>
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Note. Abbreviations: TSA = Total shoulder arthroplasty. RCT = Randomized control trial. LB = Liposomal bupivacaine. ISB = Interscalene block. PB = Plain bupivacaine. PNC = Peripheral nerve catheter. PNB = Peripheral nerve block.
Appendix B

DNP Team and Project Implementation Form

Form 1

University of Pennsylvania
School of Nursing
Doctor of Nursing Practice Program

DNP Team and Project Implementation Form

This form is to be completed by the student(s), institutional/organizational project member(s), and school of nursing project lead and submitted for approval to the DNP Program Director.

Student Name(s): Alyssa Aboff, Kirby Begley, Dilnoza Nasritdinova

Project Topic/Title: The Use of Liposomal Bupivacaine in Interscalene Blocks

UPENN School of Nursing DNP Faculty Project Lead: Angelarosa DiDonato

Institutional/Organizational 5 NP Project Member(s): Alyssa Aboff, Kirby Begley, Dilnoza Nasritdinova

I hereby accept the following proposed project pending IRB approval (completed by student[s])

Project Site(s): Pennsylvania Hospital, Philadelphia, PA

Project Purpose: Determine the efficacy of liposomal bupivacaine in interscalene blocks

Project Activities: Pain and satisfaction score assessments post shoulder arthroscopies

Participants (Describe target group; approx. # in project): Patients undergoing shoulder arthroscopies, total of 20 patients
Site(s) Support (Resources): Dr. Courtney Wells, Angelarosa DiDonato

Data Management: Alyssa Aboff, Kirby Begley, Dilnoza Nasridinova

Anticipated End Date: July 2021

University of Pennsylvania
School of Nursing
Doctor of Nursing Practice Program

DNP Team and Project Implementation Form

I hereby consent to serve on Liposomal Bupivacaine in Interscalene Blocks DNP project committee

E-mail address of doctoral student(s): aboff@upenn.edu begleyk@upenn.edu dilnoza@upenn.edu

We understand that this site’s participation will only take place during the project’s active IRB approval period. All project activities must cease if IRB approval expires or is suspended. We understand that any activities involving Personal Private Information of Protected Health Information may require compliance with HIPAA Laws and The University of Pennsylvania’s Policy. Our organization agrees to the terms and conditions stated above. If we have any concerns related to this project, we will contact the project team. For concerns regarding IRB policy or human subject welfare, we may also contact the UPENN IRB.

As a doctoral student member of this team, I agree to conduct the project to the best of my abilities with professionalism.

Student(s) signature(s):

As an institutional/organization member of this project team, I agree to read and review all drafts of the project within a timely turnaround (approx. 2 weeks)

Institutional/Organizational Project Member(s) signature(s):
As the School of Nursing DNP Project Faculty Lead, I agree to meet with the student(s) and consult throughout the project.

SON DNP Project Faculty Lead Signature

angelaro@nursing.upenn.edu

Email address/Phone:

APPROVED: 12/5/2020

(Director, Doctor of Nursing Practice Program)
Appendix C

Project Charter

AIM
The overarching goal of this educational research project is to improve postoperative pain scores among patients undergoing total shoulder arthroscopy by implementing the standardization of liposomal bupivacaine (LB) in an interscalene block (ISB) by comparing pain and satisfaction outcomes in shoulder arthroscopy patients who received LB versus plain bupivacaine (PB).

PROBLEM
The volume of total shoulder arthroplasty procedures in the United States has rapidly increased. From 2002 to 2011 the volume of this surgery performed increased by 66%; in 2011 alone, there were 66,485 patients in the United States who underwent shoulder arthroplasty procedures (Westermann et al., 2015). Pain management in post-shoulder arthroscopy patients is difficult to manage, and often requires an indwelling catheter to deliver anesthesia while the patients are admitted to the hospital, or a substantial number of opioids to maintain proper analgesia during both the intraoperative and postoperative period. Inadequate pain management can increase a patient’s medication requirements, decrease patient satisfaction, and delay patient discharge, all of which can thereby increase hospital costs.

IMPORTANCE
The evidence for the use of LB suggests that this practice change will provide effective analgesia that is superior to the use of PB, thereby decreasing additional medications needed for adequate pain management, while simultaneously increasing patient satisfaction with the quality of care and outcome of the surgical experience. LB has been shown to achieve clinically meaningful lower cumulative pain scores, reduce opioid requirements, expedite discharge from the hospital, and reduce hospital costs.

EXPECTED OUTCOMES
It is anticipated to see lower patient reported pain scores in the immediate postoperative period and after 48-hours postoperatively, and higher satisfaction scores for those patients who receive LB compared to those patients who receive PB.

MEASURES
The primary outcome of the project is the pain score postoperatively, recorded in the immediate postoperative period and at 48-hours postoperatively by a team-initiated follow-up survey via phone call. Pain scores will be measured using the NRS for pain. Patient satisfaction with anesthesia is a secondary outcome measured by a single Likert scale item during postoperative phone call. Balancing measures to monitor unintended consequences will be employed. As a balancing measure, the team will monitor adverse events related to or caused by administering regional anesthesia (as evidenced by patient reports and patient satisfaction scores).

RISKS/BARRIERS
The major challenges to this project include possible lack of access to LB due to its cost compared to PB, as well as provider hesitancy to use LB due to its novelty and lack of familiarity. Other challenges include patient retention for the 48-hour postoperative survey to assess pain and satisfaction scores.

STAKEHOLDERS
The key stakeholders in this educational research project include the anesthesia team performing the block, the orthopedic surgical team, nursing staff, and pharmacy staff. Multidisciplinary input will be received and assessed through informal discussions on a bi-weekly basis either via Zoom or in person at the hospital during the regularly scheduled Thursday morning anesthesia meetings. Patient’s perspective will be evaluated in the postoperative period by an assessment of satisfaction with the regional anesthetic received.

SCOPE

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<th>Out of Scope:</th>
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<td>All patients at the hospital and at the surgical center scheduled to receive an ISB for shoulder surgery</td>
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SCHEDULE
Education delivery to pertinent staff - February 2021
Pilot test data collection – March 2021
Study Implementation – May – June 2021
Patient participation and data collection – May - June 2021
Data Analysis – June – July 2021
Results reported to stakeholders – July 2021

PROJECT TEAM

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<tr>
<th>Team Member</th>
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<tr>
<td>Dr. Courtney Wells</td>
<td>Site Lead</td>
</tr>
<tr>
<td>Dr. Angela DiDonato</td>
<td>Faculty Lead/ Site Lead</td>
</tr>
<tr>
<td>Dr. Jason Palowsky</td>
<td>Site Lead</td>
</tr>
<tr>
<td>Ms. Alyssa Aboff</td>
<td>Project Leader, SRNA</td>
</tr>
<tr>
<td>Ms. Kirby Begley</td>
<td>Project Leader, SRNA</td>
</tr>
<tr>
<td>Ms. Dilnoza Nasritdinova</td>
<td>Project Leader, SRNA</td>
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### Appendix D

#### Gantt Chart for N853 (Project Implementation)

![Gantt Chart](image-url)
Appendix E

Numerical Rating Scale for Pain and Satisfaction Question

1. On a scale of 0 – 10, with 0 being no pain and 10 being the worst pain imaginable, how can you currently rate your level of pain?
2. I was satisfied with my anesthetic care
   (1=disagree very much, 2=disagree moderately, 3=disagree slightly, 4=agree slightly, 5=agree moderately, 6=agree very much)
Appendix F

Case Report Form

- Gender:
- Age:
- Patient Identification Number:
- Race:
- BMI:
- Modality Received:

- Post-operative pain in PACU score (NRS scale rating):
- Pain at 48 hours via phone call (NRS scale rating):
- Satisfaction at 48 hours
  - Question 1:
  - Question 2:
Appendix G

Institutional Review Board Approval

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View Protocol Application Form

List of Attached Documents

There are no documents.

Revision History: Assigned to IRB #7, created on 12/01/2020 (dcibagdi)

Department Review History

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