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Evidenced-Based Practice Guideline Development: Selection of Local Anesthetics and the Additive Dexamethasone in Brachial Plexus Blocks

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by

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Doctor of Nursing Practice Final Scholarly Project

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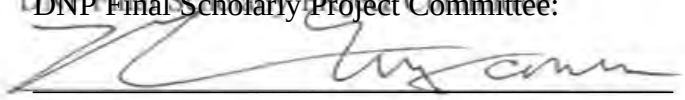
DNP Final Scholarly Project Committee:



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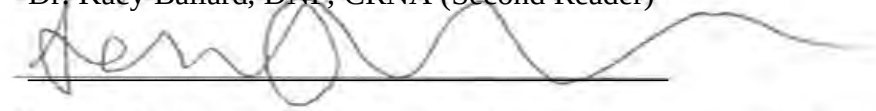

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Executive Summary

Brachial plexus blocks (BPB) are a type of regional anesthesia that inhibits the sensory and motor function of the upper extremity. The efficacy of a BPB depends on the type and dose of local anesthetics (LA), as well as the use of any additive agent. The selection of LA depends on the type, concentration, and volume of LA. Certain additives, such as dexamethasone, when added to BPB, were shown to increase motor and sensory block duration.

A chart audit conducted by the pharmacy and anesthesia departments revealed a significant variability of clinical practice in the use of LA and additives in BPB at a large Level 1 trauma center. The audit also revealed that only 46.4% of anesthesia providers used the additive dexamethasone. Further complicating the issue, key stakeholders also reported a lack of standardized evidence-based practice (EBP) guidelines for the choice of LA and additives utilized in BPB, which may have also contributed to the inconsistent practice among providers.

The following objectives and methods were framed using the Johns Hopkins Model for EBP and were established to achieve the project's goals: 1) synthesize the evidence around the choice of LA and the additive dexamethasone with BPB, 2) develop a guideline based on the evidence, and 3) present the guideline to the Clinical Process Improvement Team (CPIT). To enhance EBP guideline development, data was compiled through a systematic review and local/national/standard clinical practice guidelines, using the Johns Hopkins Nursing Evidence-Based Practice Synthesis and Recommendations Tool.

The project was significant because the incorporation of newly developed EBP guideline into clinical practice may improve patient outcomes. The findings of the scholarly project served as a beginning point for a greater understanding of the importance of EBP, clinical knowledge, and policy. The guideline was communicated to the anesthesia and pharmacy departments for potential implementation.

Introduction

Clinical Problem

Brachial plexus blocks (BPB) are a type of regional anesthesia where a local anesthetic (LA) is injected in the neck, over the first rib, or around the axilla near a group of nerves, called the brachial plexus, to inhibit motor and/or sensory function of the upper extremity from hours to days (Kukreja et al., 2019). The efficacy of a BPB depends on the type and dose of LA, as well as the use of an additive agent. The selection of LA depends on the type, concentration, and volume of LA. The most common LA used in BPB are ropivacaine, bupivacaine, and lidocaine. Additive agents, such as dexamethasone, may be added with the LA to prolong the duration of analgesia (DOA) (Bindal et al., 2018).

Despite substantial evidence demonstrating best practices and benefits of LA and additive use with BPB, chart audit reports by pharmacy and anesthesia department stakeholders revealed a wide variability of clinical practice in the use of LA and additives in BPB among the anesthesia providers at the large Level 1 trauma center. Further complicating the issue, key stakeholders also reported that the hospital lacked a standardized evidence-based practice (EBP) guideline for the choice of LA and additives for BPB, which may have also contributed to the current state of inconsistent practice among anesthesia providers.

A preliminary audit of paper-charted anesthesia notes by key stakeholders revealed that most providers use 30 ml of 0.5% ropivacaine for their BPB. However, some providers routinely preferred to use other LA (bupivacaine) or combine two types of LA (lidocaine and ropivacaine). Additionally, only 46.4% of anesthesia providers (i.e., thirteen providers out of twenty-eight providers) were noted to utilize the additive dexamethasone with BPB. Other anecdotal reports from staff in the pharmacy and anesthesia departments disclosed that anesthesia providers

regularly selected the same dose of LA and additive despite the variation in patient presentations (B. Garrett, personal communication, August 19, 2019; S. Jordan, personal communication, June 12, 2020). Therefore, a clinical practice gap existed between current anesthesia practice and the evidence-based literature recommendations for BPB using LA and the additive dexamethasone.

Problem Statement

The PICO format provides a framework for examining and answering a specific question related to the previously described problem (Melnyk & Fineout-Overholt, 2005). The four components include "population of interest [P], the intervention of interest [I], comparison of interest [C], and outcome of interest [O]" (Melnyk & Fineout-Overholt, 2005, p. 29). The format was used to develop the clinical question as well as provide strategic key search terms to obtain the best evidence from the literature for the project. The clinical practice-focused question (based on PICO format elements) guiding the project asked: in patients who received BPB (P) how does the use of 30 ml 0.5% ropivacaine and the additive agent dexamethasone (I) compared to BPB with varied LA types or volumes without an additive agent (C) affect postoperative patient outcomes?

Literature Review

A thorough review of the literature was conducted using key search terms derived from the PICO question. Electronic databases were used as a source of external evidence to discover research that either did support, did not support or was inconclusive related to the intervention PICO question. Two bibliographic databases, Cumulative Index to Nursing and Allied Health Literature (CINAHL) and PubMed, and one pre-appraised source, Cochrane Database of Systematic Reviews (CDSR) were used to search for literature. Keyword searching, Boolean connectors, and limits were the search strategies used to find relevant literature. The keywords

used were as follows: *peripheral nerve block, brachial plexus block, upper extremity nerve block, surgery, local anesthetics, ropivacaine, bupivacaine, lidocaine, additives, dexamethasone, motor block, sensory block, analgesia block, postoperative pain, opioid consumption, guidelines,* and *quality improvement.* Boolean connectors, *AND* Binodal *OR*, were used to either narrow or widen the search results, respectively. Limits were used to filter the search results by literature less than five years old, academic journals, and study type. A rapid critical appraisal checklist specific to each study design was performed (Melnyk & Fineout-Overholt, 2019). The evidence was then analyzed to see if the intervention PICO question could be answered from the evidence found.

The search for articles related to LA types and doses yielded two systematic reviews (SR), one randomized control trial (RCT), and two retrospective cohort studies. The studies' sample size ranged from 99 to 2,953. All but one study assessed the efficacy of ropivacaine as the primary LA. The search for articles related to the additive dexamethasone yielded six articles that were RCT, and two articles were SR. The two SR sample sizes were 751 and 783, while the other six studies averaged a sample size around 60-100. All eight studies utilized adult patients who were scheduled for surgery and received a BPB. Both SR utilized the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) system which is a framework that grades the quality of evidence (BMJ Best Practice, 2020).

Concentrations of Ropivacaine

Ropivacaine was the primary LA assessed in most of the studies. In a study by Zhai et al. (2016), the researchers assessed the onset of 50 mg of ropivacaine in three different concentrations (6.7 ml of 0.75%, 10 ml of 0.5%, and 20 ml of 0.25%) for BPB. Onset times were significantly quicker in the higher concentration group of 0.75% (Zhai et al., 2016). Also, the

lowest concentration group of 0.25% had the most patients who did not achieve complete motor blockade within 30 minutes (Zhai et al., 2016). Zhai et al (2016), also noted no significant difference with postoperative analgesia between the three groups.

Combination of Lidocaine and Ropivacaine

Nakayamaet et al. (2017), assessed the most effective analgesia achieved by three different combinations of 1% lidocaine and 0.75% ropivacaine (1% lido 10 ml + 0.75% ropi 20 ml; 1% lido 20 ml + 0.75% ropi 10 ml; and 1% lido 10 ml + 0.75% ropi 15 ml). The different combinations of agents did not influence the evaluation items (Nakayamaet et al., 2017). The group with 25 ml of LA total did require additional LA during surgery compared to the other groups which contain 30 ml of LA (Nakayamaet et al., 2017). The group with the most lidocaine (20 ml) experienced low SpO2 rates, and LA toxicity was slightly higher than the other groups (Nakayamaet et al., 2017).

Bupivacaine versus Ropivacaine

A study by Bindal et al. (2018), compared the analgesic efficacy of dexamethasone additive in 0.5% ropivacaine 30 ml to 0.5% bupivacaine 30 ml. Dexamethasone was found to significantly prolong the time for request of the first rescue analgesia for both types of LA groups (Bindal et al., 2018). There was a more significant increase in the DOA, duration of sensory block (DOS), and duration of motor block (DOM) in the ropivacaine groups than bupivacaine groups (Bindal et al., 2018).

Effectiveness of the Additive Dexamethasone

Researchers have studied the effectiveness of additive agents in BPB. Pehora et al. (2017) conducted a SR with 35 RCT to analyze the effectiveness of the additive agent dexamethasone. The study examined the effectiveness of BPB with perineural dexamethasone versus placebo,

intravenous (IV) dexamethasone versus placebo, and perineural dexamethasone versus IV dexamethasone to control postoperative pain. Perineural dexamethasone versus the placebo category had dexamethasone mixed with LA. IV dexamethasone versus the placebo group had perineural LA and systemic IV dexamethasone. The study evaluated the postoperative pain score and opioid consumption at 12, 24, and 48 hours after surgery. Results showed perineural dexamethasone prolonged DOS by a mean deviation (MD) of 6.70 hours. Furthermore, the perineural dexamethasone group's postoperative pain score was lower by a MD of 2.08 in 12 hours and 1.63 in 24 hours. Additionally, the study found IV dexamethasone group had lower pain scores compared to the placebo. However, IV dexamethasone groups had higher pain scores compared to the perineural dexamethasone groups. The study found no difference in postoperative pain intensity at 48 hours. Furthermore, in 24 hours, the opioid consumption by the people in the dexamethasone group was on average 19.25 mg lower than the other group.

Another study by Sakae et al. (2017) compared the effectiveness of nerve blocks using only ropivacaine, the additive dexamethasone with ropivacaine, and ropivacaine combined with IV dexamethasone. The double-blind, RCT had 20 patients in each group. The study found a statistically significant increase in the DOA among patients who received 4mg of dexamethasone. However, there was no significant difference in the DOA for patients who received either only ropivacaine or ropivacaine with IV dexamethasone. Postoperative opioid consumption in the first 24 hours was higher among patients who received only ropivacaine. Additionally, Heesen et al. (2018) had conducted a SR to evaluate the outcome of IV dexamethasone versus perineural dexamethasone. The result was similar to the Sakae et al. (2017) findings. Compared to IV dexamethasone, perineural dexamethasone prolonged analgesia by 241 minutes, DOS by 139 minutes, and DOM by 235 minutes.

Effectiveness of Variable Doses of the Additive Dexamethasone

Dexamethasone is one of the common additive agents in the United States. Dexamethasone is proven to be effective in managing postoperative pain and reducing opioid consumption. However, dexamethasone has some serious side effects such as Horner syndrome, hoarseness, and cranial nerve XII palsy (Pehora et al., 2017). Therefore, Kahn et al. (2018) evaluated the role of low-dose dexamethasone as an adjuvant with bupivacaine for BPB. To study the analgesic effect, the study utilized 1 mg of dexamethasone as an additive agent with 15 ml of 0.5% bupivacaine. Then, the study compared the finding with a group without additive agents. The study's uniqueness was the use of 1mg dexamethasone as all other published articles have used at least 4 mg of dexamethasone. The findings revealed that the patients who received the additive dexamethasone had prolonged analgesia by an average of 5.5 hours and groups who had blocks without the additive had an average of 3.5 hours of pain control. The study showed that using only 1 mg of dexamethasone is better for pain management than not using the additive agent. However, there was no difference in the amount of opioid consumption between the groups. Following Kahn et al.'s (2018) study, Albrecht et al. (2019) also studied the effect of varying dexamethasone doses of 1 mg, 2 mg, 3 mg, and 4 mg with ropivacaine 0.5%. The Albrecht et al. (2019) study also showed a prolonged analgesic effect of using an additive even at a dose of 1 mg. Furthermore, Chalifoux et al. (2017) compared 4 mg versus 10 mg of IV dexamethasone with a control group of normal saline. Chalifoux et al. (2017) found that low doses of IV dexamethasone significantly prolong the analgesic duration of BPB. Prolonged analgesia leads to significantly lower patient opioid consumption than the control group (Chalifoux et al., 2017). From these three studies, the findings were inferred that regardless of the type of LA (bupivacaine in Kahn et al., 2018 study, and ropivacaine in Albrecht et al., 2019

study), having an additive agent is always better for pain control. Additionally, these studies showed the effectiveness of 1 mg dexamethasone, which would be effective for people who cannot tolerate large doses of dexamethasone.

Potential Adverse Effects of Dexamethasone

Even though the additive dexamethasone shows beneficial effects, there are a few adverse effects associated with it. Dexamethasone is linked with a longer sensory block duration than the desired period, transient increase in blood sugar level, and increased risk of infections among immunocompromised patients (Kahn et al., 2018). Pehora et al., (2017) reviewed 720 samples to compare the effect of dexamethasone. Out of those samples, only four developed adverse effects related to dexamethasone. Two participants required hospitalization within a week of the surgery: one for a fall and one for a bowel infection. One participant developed complex regional pain syndrome and one participant developed pneumonia. A limitation was the quality of evidence, which was very low due to the sparse number of events. Even though there was evidence that suggested some associated risks with using the additive dexamethasone in patients with compromised immune systems, the evidence was sparse and low level. Therefore, due to the substantial evidence that supports dexamethasone's use with BPB, the benefits outweigh the risks.

Literature Review Summary

Regional anesthesia such as BPB are becoming more popular due to the fewer side effects than general anesthesia (Hettrich et al, 2019). According to the American Society of Regional Anesthesia (ASRA) (2019), persistent pain after shoulder surgeries is a very common issue. According to Chou et al. (2016), approximately 80% of patients who undergo surgical procedures experienced acute pain, out of which more than 75% characterized their pain as

moderate to severe. Severe pain during the early postoperative period is linked to developing chronic pain which affects the patients' quality of life and increases healthcare costs (Pehora et al., 2017). ASRA (2019) states opioids are frequently used to manage early postoperative pain; however, the use of opioids is limited due to respiratory and cardiovascular complications. Therefore, BPB are utilized more to provide better postoperative analgesia.

Selecting the appropriate type of LA and additive helps to prolong block duration. Therefore, it is imperative to consider an agent's effectiveness while determining the ways to control pain in postoperative patients. Various studies have shown that 30 ml of 0.5% ropivacaine is a useful agent for BPB displaying a rapid onset and prolonged pain relief effect (Bindal et al., 2018 & Nakayamaet et al., 2017). Additionally, additive agents, such as dexamethasone, are common agents that prolong the DOA, DOM, and DOS (ASRA, 2019). Therefore, based on the literature, 0.5% ropivacaine with the additive dexamethasone provides better postoperative pain management and reduces opioid consumption.

Project Implementation and Measures

Project Purpose

The purpose of the project was to develop and provide the hospital with a practice guideline using the best evidence from the literature. Feedback from various committees was utilized to gain insight into creating the guideline. The goal of the guideline was to provide leadership with evidence-based recommendations that can be used to help streamline and improve the quality and consistency of future anesthesia delivery of BPB. The final guideline was not implemented at the selected hospital due to the nature of the Doctor of Nursing Practice (DNP) program's academic/curricular timeline. The project served as a model to assist future

DNP students in creating guidelines or the continuation of the project with the implementation phase.

The following objectives and methods were framed using the Johns Hopkins Model for EBP and were established to achieve the project's overall aim: 1) synthesize the evidence around the choice of LA and the additive dexamethasone with BPB, 2) develop a guideline based on the evidence, and 3) present the guideline to the Clinical Process Improvement Team (CPIT). To enhance EBP guideline development, data was compiled through a SR and local/national/standard clinical practice guidelines, using the Johns Hopkins Nursing Evidence-Based Practice Synthesis and Recommendations Tool. In addition, meetings with key stakeholders and the project team occurred and subsequent feedback was incorporated into the development of the EBP guideline for clinical expert engagement, buy-in, and support.

To ensure the most appropriate and effective process for submission, review, and EBP guideline approval, the project team consulted the Clinical Outcomes Manager for Surgery/Anesthesia. The project team was informed that there were several factors to consider when determining which councils and committees need to approve a new policy/guideline. These factors were dependent on the owner/department (i.e., Anesthesia, Pre-op/PACU, Endo, etc.) of that policy. Some policies only required CPIT approval, while others required additional reviews from various committee teams (C. Persichetti, personal communication, February 24, 2021). The project focused on developing practice guidelines for anesthesia providers performing a BPB within the surgery/anesthesia service departments, and the project chair was a doctorate-prepared, Certified Registered Nurse Anesthetist (CRNA). The project team developed a guideline using the best evidence and submitted it to the CPIT committee for review. Implementation of the EBP guideline was not completed due to the nature of the DNP program's academic/curricular timeline.

Project Methodology

The appropriate type and dose of LA with the additive dexamethasone was shown to increase motor block duration, decrease postoperative pain, and decrease opioid requirements when added to BPB. Despite substantial evidence demonstrating best practices and benefits of 0.5% ropivacaine with the additive dexamethasone in BPB, recent chart audit reports by pharmacy and anesthesia department stakeholders revealed wide variability in clinical practice of the use of LA and additives in BPB. Further complicating these issues, key stakeholders also reported that the hospital lacked a standardized guidelines for the use of LA and additives in BPB. As a result, the ability to identify and prioritize practice gaps, contributing factors, or potential solutions to alleviate these burdens remained impaired, affecting clinical practice and post-surgical patient outcomes. Subsequently, the patients who underwent surgical procedures and received varied LA without the combined benefits of the additive dexamethasone may have been at increased risk for suboptimal outcomes.

Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) Model

The Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) Model, as shown in Figure 1, is a clinical problem solving and decision-making model. The JHNEBP Model helps to address clinical needs using practice questions, evidence, and translation (PET) with a hope to quickly incorporate the latest findings for patient care (Newhouse et al., 2017). Permission was granted by John Hopkins University to use the tool. The project followed the JHNEBP Model up through Step 3 (best practices). The project team members were unable to implement Step 4 (practice improvement) because the guideline implementation required multiple levels of

approval and staff education. The guideline was distributed to the anesthesia and pharmacy departments for possible future implementation.

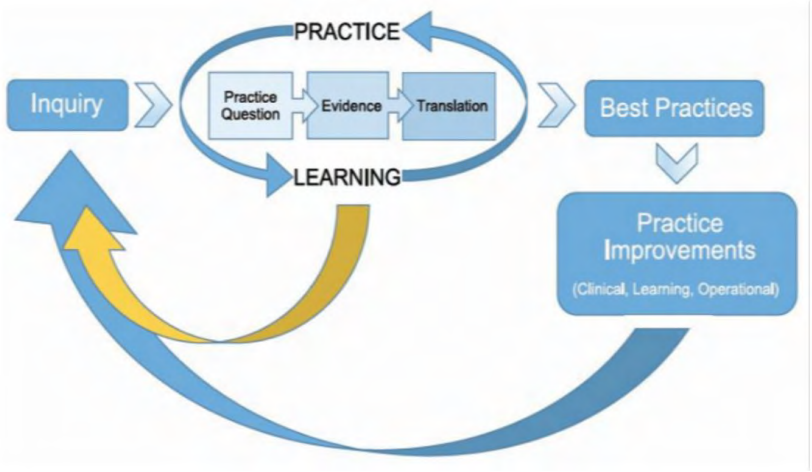

Figure 1: *Illustration of Johns Hopkins Nursing Evidence-Based Practice Model* (Newhouse et al., 2017).

JHEBP Model Step 1: Inquiry

Issues prompting inquiry can arise from a multitude of sources, including patient satisfaction, wide variation in practice, and a lack of EBP (Newhouse et al., 2017). Inquiry is the process used to identify the scope of the problem and the opportunity for improvement. EBP inquiry includes knowing current practices, following steps to identify issues, and gathering evidence to address the issues (Newhouse et al., 2017).

The practice issue at the selected hospital was the lack of an evidence-based clinical guideline for the use of LA and additives utilized in BPB. The practice issue was identified after several meetings with key stakeholders in anesthesia and pharmacy departments, by auditing providers' preference lists, and systematically analyzing high-level currently published literature. The current practice of LA and additive selection at the selected hospital appeared to be based on provider preference and not on current EBP. The anecdotal data gathered from key stakeholders identified that providers were not consistent with the choice and dose of LA and additive use.

The evidence required for EBP guideline development was compiled through a SR and local/national/standard clinical practice guidelines, using the Johns Hopkins Nursing Evidence-Based Practice Synthesis and Recommendations Tool.

JHEBP Model Step 2: Practice and Learning

Practice questions. The first step of translating evidence into practice starts with a practice question. The practice question helps guide the next step, the search for evidence (Newhouse et al., 2017). The clinical practice-focused question (based on PICO format elements) guiding the project asked: in patients who received BPB (P) how does the use of 30 ml 0.5% ropivacaine and the additive agent dexamethasone (I) compared to BPB with varied LA types or volumes without an additive agent (C) affect postoperative patient outcomes?

Evidence. The second step was searching for evidence and bringing the items back for committee review (Newhouse et al., 2017). Types of evidence that can be used are as follows: "research studies; EBP practice guidelines; quality improvement data; position statement from professional organizations; opinions of internal and external experts; regulatory, safety, or risk management data; community standards; or patient survey and satisfaction data" (Newhouse et al., 2017, p 44). The selected articles were appraised using the Johns Hopkins Nursing Evidence-Based Practice Synthesis and Recommendations Tool. Based on the appraisal of the evidence, the project team developed a recommended EBP guideline.

Literature has demonstrated the effectiveness of LA and additive agents in BPB for postoperative pain management. Studies have shown certain types and doses of LA and additive agents are effective in prolonging the DOS and DOM in BPB. Even though additive agents are shown to be effective, providers at the chosen hospital were varied in their choice of LA and were not using additive agents consistently.

Discussions with key stakeholders from the pharmacy and anesthesia departments along with observational findings from a preliminary audit of hard-copy paper anesthesia notes revealed that most providers use 30 ml of 0.5% ropivacaine for BPB. Additionally, only 46.4% of anesthesia providers used the additive dexamethasone with BPB. Additional anecdotal reports from various staff in the pharmacy and anesthesia service departments disclosed that anesthesia providers regularly select the same LA and additive despite variation in patient presentations and contradictory to the substantial evidence demonstrating best practices.

Therefore, a clinical practice gap existed between current anesthesia practice and the evidence-based literature recommendations for the use of LA and the additive dexamethasone in BPB. Subsequently, the patients who underwent surgical procedures and inconsistently received LA without the combined benefits of the additive dexamethasone may have been at increased risk for suboptimal outcomes. With this being stated, there was an opportunity to improve anesthesia provider practice and patient outcomes.

Translation. In the third step, the team studied the feasibility for changes at the hospital to produce an action plan (Newhouse et al., 2017). Utilizing evidence-based recommendations of LA and additive agent choice for BPB was feasible at the selected hospital. However, hospital practice was not based on current evidence due to a lack of practice guidelines. Numerous research studies suggested that evidence-based guideline development and implementation reduced clinical practice variability, supported improved patient care outcomes, and facilitated cost-effectiveness while helping to ensure compliance with the requirements of regulatory and accreditation agencies. The project:

a. Identified key stakeholders from the pharmacy and anesthesia departments to help develop clinical practice guidelines on LA and additive agents use in BPB.

b. Presented an overview of the problem and need for clinical practice change using the Strength, Weakness, Opportunity, Threat (SWOT) analysis briefing format to all stakeholders and policy approving CPIT committee members.

A SWOT analysis (see "Appendix A") briefing format was used during project members' meetings to develop the EBP guideline related to the use of LA and the additive dexamethasone in BPB. A SWOT analysis is a process of identifying a company's Strengths, Weaknesses, Opportunities, and Threats (Moran et al., 2018). The strength components were focused on the current LA and additive selection. The weakness components investigated the current LA and additive selection but focused on the downfalls of the process. The opportunity component explored the desired LA and additive selection. The threat component addressed barriers or individual reluctance the project may face. The SWOT analysis helped develop a full awareness of all factors involved in LA and additive selection in BPB at the selected hospital and assisted with EBP guideline development.

JHEBP Model Step 3: Best Practices

The Practice and Learning phases led to the development of best practices. Such decisions are scientifically supported, but the rate of implementation of knowledge into practice is often slow. The project aimed to improve best practices in BPB at the selected hospital by developing an EBP guideline. To complete the development, data was compiled through a SR and local/national/standard clinical practice guidelines, using the Johns Hopkins Nursing Evidence-Based Practice Synthesis and Recommendations Tool. Additionally, the project team members had regular meetings with key stakeholders and subsequent feedback was incorporated into the development of the EBP guideline. The project submitted the evidence-based clinical

practice guideline to the anesthesia and pharmacy departments for further review, approval, and potential implementation.

JHEBP Model Step 4: Practice Improvement

Practice improvement is completed by disseminating and implementing best practices to enhance outcomes for people receiving services (Foreman-Hoffman et al., 2017). The project team was unable to implement the guideline due to the nature of the DNP program's academic/curricular timeline. The EBP guideline was communicated to the anesthesia and pharmacy departments for potential future implementation.

Project Timeline

The project was divided into multiple sections to ensure timely completion (see Table 1). The Institutional Review Board (IRB) process was considered the first phase. The IRB process consisted of continuous refinement and presentation of the project to advisors until a satisfactory project was developed. The IRB process also included an IRB application, IRB decision, and guidelines from IRB. The IRB process happened between January 2021 and April 2021.

The second phase consisted of EBP guideline data collection & attending clinical practice guideline approving committee meetings by project members. Data was compiled through a SR and local/national/standard clinical practice guidelines, using the Johns Hopkins Nursing Evidence-Based Practice Synthesis and Recommendations Tool. Meetings with key stakeholders and the project team occurred and subsequent feedback was incorporated into the development of the EBP guideline. The second phase happened between May 2021 and August 2021.

The third phase involved EBP guideline development and a final scholarly report. A final EBP guideline was developed based on the phase 2 data and feedback between September 2021 and December 2021. The final scholarly report was created along with a poster presentation. At the end of the project, the work was presented to a board for review and defended by the students

in February 2022. Lastly, the poster was presented to the Otterbein University Nursing Department faculty and students at an open forum in April 2022.

Ethical Considerations/Protection of Human Subjects

Ethical considerations for the project involved protecting the participants' identities. Careful measures were taken to protect personal information. Following the review and determination by the selected hospital Nursing Evidence-Based Practice Review Committee (NEBPRC), the NEBPRC approved proposal (see "Appendix C") was submitted as part of an application to the Otterbein University IRB for approval before initiating the DNP Final Scholarly Project. Once Otterbein University IRB official approval (see "Appendix D") was obtained, the document was submitted to the selected hospital NEBPRC for record-keeping. Confidential health information such as names or unique patient/staff identifiers were not requested, collected, or stored. All collected information was fully de-identified before storage into a password-protected, secure spreadsheet as previously described. All physical data was locked in file drawers. Only de-identified aggregate data was shared outside of the selected hospital with Otterbein University Nursing Department faculty and students as part of the dissemination of the project presentation (in partial fulfillment of the requirements for the degree).

Analysis and Outcome Evaluation

Project Evaluation

Evaluation of the project involved the ability to 1) collect and appraise data through SR and local/national/standard clinical practice guidelines and 2) develop a EBP guideline and submit for initial committee review. Incorporation of the newly developed EBP guidelines into clinical practice may lead to improvements in patient outcomes. The findings of the scholarly

project also served as a beginning point for a greater understanding of the importance of EBP, clinical knowledge, policy, and anesthesia practice impacts on outcomes of post-operative patients.

Limitations

The project had several limitations. The project was successful in developing a guideline; however, the current members were not able to implement the guideline due to the nature of the DNP program's academic/curricular timeline. The project's timeline was negatively impacted by the ongoing COVID-19 pandemic as the first scheduled CPIT meeting had to be rescheduled due to hospital mandates. Additionally, the project's guidelines were limited to a review of the literature without confirmation by quality metrics from EBP guideline implementation.

Dissemination

After reviewing the literature, an EBP guideline was developed. The evidence suggested that 30 ml of 0.5% ropivacaine with dexamethasone 4 mg is the most appropriate dose to provide optimal patient outcomes. The guideline was initially reviewed and edited by the project leader. Then the guideline draft was submitted to the Clinical Outcomes Manager for Surgery/Anesthesia and CPIT. The guideline was presented to the CPIT committee during an October 2021 meeting. Along with the presentation, a copy of the guideline, the DNP project proposal paper, and SWOT analysis findings were distributed to all CPIT members. After the presentation, questions by the CPIT members were answered and feedback from CPIT members were considered for refinement of the guideline. Per a request from the anesthesia department, a literature review table containing an analysis of 21 studies was submitted. The CPIT meeting experience allowed team members to learn critical aspects and experience in guideline development. The final EBP guideline (see "Appendix B") was submitted to the anesthesia and

pharmacy departments for further review and approval. Lastly, the final guideline and project paper were submitted to the NEBPRC.

Implications for Future Projects

Guideline development provided leadership at the selected hospital with evidence-based recommendations that can be used to help streamline and improve the quality and consistency of future anesthesia delivery of BPB. The findings of the scholarly project served as a beginning point for a greater understanding of the importance of EBP, clinical knowledge, policy, and anesthesia practice impacts on outcomes of post-operative patients. The project also served as a model to help incoming DNP students create a guideline or allow students to continue the project in the implementation phase.

Conclusion

BPB are a type of regional anesthesia that inhibits the sensory and/or motor function of the upper extremity. The literature review suggested that 30 ml of 0.5% ropivacaine with dexamethasone 4 mg is the most appropriate dose to provide optimal patient outcomes. The project developed a practice guideline based on the selection of LA and the additive dexamethasone in BPB to address the clinical practice gap identified at the hospital. The goal of the guideline was to provide leadership with an evidence-based recommendations that can be used to help streamline and improve the quality and consistency of future anesthesia delivery of BPB. The consistent use of 30 ml of 0.5% ropivacaine with dexamethasone 4 mg for BPB may lead to improvements in patient outcomes as a result.

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Appendix A

SWOT Analysis

The purpose of the SWOT analysis was to allow scholars to gather data for an evidence-based practice (EBP) guideline focusing on the selection of local anesthetics and additives used in brachial plexus blocks (BPB) (Example as follows using preliminary audit information):

Strengths: ● 46.4% of providers were utilizing additives ● The most used additive was dexamethasone ● The most used LA was ropivacaine ● Additives helped with better pain management and sensory block	**Weakness:** ● Lack of LA and additive guidelines ● Lack of pre-set orders ● Lack of individual variation consideration while administering additives
Opportunities: ● Improved block process and time ● Improved block duration of action ● Improved postoperative patient outcomes	**Threats:** ● Providers reluctant to change ● Lack of preferred additives ● Individual experience

Appendix B

Guideline

TITLE: Selection of Local Anesthetics and the Additive Dexamethasone in Brachial Plexus Blocks	**NUMBER:**
ISSUE DATE:	**EFFECTIVE DATE:**
DEVELOPED / REVISED BY: Sabina Lamichhane Wagle & Alexandra McGuire	
REVIEWED BY: Department of Anesthesiology Surgery/Anesthesia CPIT	**DATE REVIEWED:** 10/06/2021
APPROVED BY:	

SCOPE - This guideline is in effect for the following selected hospital

STATEMENT OF PURPOSE:

The purpose of this guideline is to provide evidence-based practice recommendations regarding the selection of local anesthetics (LA) and the additive dexamethasone in brachial plexus blocks (BPB). BPB efficacy can be affected by the type and dose of LA, as well as the use of any additive agent. Additive agents, such as dexamethasone, are added to LA to increase motor and sensory block duration, provide analgesia, and decrease opioid requirements. Selection of LA and the additive agent dexamethasone includes assessing their indication and contraindications, risks and benefits, types of surgery, required block duration, and institution of corrective measures to address any complications.

Consideration generally includes:

- Obtaining appropriate pre-op assessment of the patient.
- Addressing patients' consents and surgeons' preferences.
- Availability and costs of the LA and additive.
- Utilizing technical aspects during administration, such as ultrasound.
- Availability of anesthesia provider to address complications.
- Availability of medications to address any potential complications (including lipid emulsion).
- Providing appropriate post-anesthesia care following BPB.

DEFINITIONS:

- **Analgesia:** absence of the sensation of pain.
- **Brachial plexus block:** peripheral nerve blockade of the brachial plexus.
- **Motor block:** nerve blockade that paralyzes the motor function of a muscle.
- **Sensory block:** selectively inhibit pain transmission while leaving motor function intact.

POLICY:

The guideline applies to the use of regional anesthesia in which LA and additives are administered to the patient. This guideline assists anesthesia providers in the selection of LA and the additive dexamethasone for BPB. The guideline is intended to direct quality patient care without guaranteeing a specific patient outcome. The guideline is not a substitute for clinical judgment and does not establish legally enforceable requirements or responsibilities. The 2017 American Society of Anesthesiologists guidelines should be consulted directly.

GUIDELINE

I. **Local Anesthetic Selection**
   A. **Type**:
      1. Ropivacaine is the recommended type of local anesthetic:
         a. Rationale for recommending Ropivacaine:
            1) Ropivacaine has a faster sensory and motor onset
            2) Ropivacaine showed stronger effects with the additive dexamethasone compared to Bupivacaine
      2. Other local anesthetics that can be used:
         a. Bupivacaine
            1) Bupivacaine has demonstrated an enhanced motor blockade, but also demonstrated more cardiac toxic effects
         b. Lidocaine and Ropivacaine
            1) No statistical differences between varied doses of LA combinations
            2) Higher lidocaine volume can cause more negative side effects, such as lower pulse oximetry levels and local anesthetic toxicity
   B. **Dose**:
      1. 30 ml of 0.5% Ropivacaine is the recommended dose
      2. Other local anesthetics doses that can be used:
         a. 30 ml of 0.5% of Bupivacaine
         b. 10 ml 1% Lidocaine and 20 ml 0.75% Ropivacaine
      3. Volume may vary depending on UNB location
   C. Recommended criteria:
      1. Common inclusion criteria:
         a. ASA physical status I-III, 18-65 years old, upper extremity surgery
      2. Common exclusion criteria:
         a. Allergy to amide LA, short duration of blockade

II. **Dexamethasone Selection**

A. **Route**:

1. Perineural dexamethasone is the recommended route
2. Intravenous dexamethasone can also be used

B. **Dose**:

1. 4 mg of perineural dexamethasone is the recommended dose:
    a. Studies showed 10 mg of dexamethasone had the same effects as 4 mg
    b. Higher doses (> 4 mg) were associated with perineal pruritus, paresthesia, transient increase in blood sugar level, and increased risk of infections
2. < 4 mg of dexamethasone can also be used
    a. 1 mg dexamethasone is better for pain management than not using dexamethasone

C. Recommended criteria:

1. Common inclusion criteria:
    a. ASA physical status I-III, 18-65 years old, elective ambulatory surgery
2. Common exclusion criteria:
    a. Allergy to dexamethasone, long-term steroid therapy, immunocompromised patients, uncontrolled diabetes mellitus

Appendix C

Nursing Evidence-Based Practice Review Committee Approval Letter

Sabina Lamichhane-Wagle
Allie McGuire
Otterbein University

March 1, 2021

RE: Evidenced Based Practice Guideline Development: Selection of Local Anesthetics and Additive Dexamethasone in Upper Extremity Nerve Blocks

Dear Ms. Lamichhane-Wagle and Ms. McGuire:

The Nursing Evidence-Based Practice Review Committee (NEBPRC) has reviewed the proposal referenced above. Clear evidence was submitted to justify both the need for the practice change and that evidence supports the proposed plan. You have adequately addressed all concerns from the pre-review and the revisions are accepted.

The NEBPRC has determine that the project proposal you submitted does not meet the Federal definition of research as cited in CFR 45-46:102. According to the Federal Code, research is defined as:

> (l) *Research* means a systematic investigation, including research development, testing, and evaluation, designed to develop or contribute to generalizable knowledge. Activities that meet this definition constitute research for purposes of this policy, whether or not they are conducted or supported under a program that is considered research for other purposes.

You have permission to implement the evidenced-based practice change as written proving that the unit manager at the intended intervention site is in agreement. Upon completion of the project and before dissemination (poster or manuscript), you must submit the results so that the OhioHealth can review the presentation to ensure Health Insurance Portability and Accountability Act (HIPAA) compliance.

Congratulations on your progress towards this worthy endeavor.

Teresa Wood PhD, RN, NEA-BC

Teresa Wood PhD, RN NEA-BC
Program Manager, Nursing Research

Appendix D

Otterbein University IRB Approval

OTTERBEIN UNIVERSITY

INSTITUTIONAL REVIEW BOARD

__X__ Original Review
_____ Continuing Review
_____ Amendment

Dear Dr. Garrett,

With regard to the employment of human subjects in the proposed research:

HS # 20/21-45
Garrett, Lamichhane-Wagle, McGuire, et al.: Evidenced Based Practice Guideline …

THE INSTITUTIONAL REVIEW BOARD HAS TAKEN THE FOLLOWING ACTION:

We have determined that the proposed activity is not characterized as human subjects research, in that the investigators are not:

1. Obtaining information or biospecimens through intervention or interaction with the individual, and using, studying, or analyzing the information or biospecimens; or
2. Obtaining, using, studying, analyzing, or generating identifiable private information or identifiable biospecimens.

Therefore, IRB review is not required.

Date: 06 March 2021 Signed: Meredith C. Frey
Chairperson

(Revised January 2019)

Table 1

Timeline

Timeframe	Item
January – April 2021	Institutional Review Board (IRB) process
May – August 2021	EBP guideline data collection & clinical practice guideline approving committee meetings
September – December 2021	EBP guideline development & final scholarly report
January – March 2022	Project defended & disseminated