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Administering Dexamethasone Prior to Peripheral Nerve Blocks

Jacob Millwood

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Administering Dexamethasone Prior to Peripheral Nerve Blocks

by

Jacob Daniel Millwood

A Capstone Project
Submitted to the Graduate School,
the College of Nursing,
and the Department of Advanced Practice
at The University of Southern Mississippi
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Nursing Practice

December 2017

Administering Dexamethasone Prior to Peripheral Nerve Blocks

by Jacob Daniel Millwood

December 2017

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ABSTRACT

Administering Dexamethasone Prior to Peripheral Nerve Blocks

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Post-operative pain creates burdens for the patient and their family members while also drastically increasing the price of cost to the healthcare system. The Institute of Medicine Committee on Advancing Pain Research, Care, and Education states that the annual economic cost of chronic pain in adults is \$560-630 billion (IOM, 2011). Regional anesthesia has been shown to provide potent analgesia that often times leads to a reduction in systemic analgesic requirements, opioid related side effects, general anesthesia requirements, and possibly the incidence of chronic post-operative pain. There are several adjunct medications that can be combined with peripheral nerve blocks to prolong the duration of action and provide longer periods of analgesia. Dexamethasone is a glucocorticoid that has been shown to increase the efficacy of peripheral nerve blocks during the post-operative phase of surgery when administered intravenously.

An informal survey was performed at a hospital in the southeastern portion of the United States among anesthesia providers revealing that dexamethasone was not being administered when performing peripheral nerve blocks. A quality improvement educational project was performed from literature supporting the project. A pre-intervention survey was implemented followed by the presentation. A post-intervention was then provided to the participating anesthesia providers and the results of the two surveys were then compared. The results showed an increase in the number of providers who administered dexamethasone intravenously prior to peripheral nerve blocks. A

majority of the participants stated that the intervention influenced their decision to administer intravenous dexamethasone when performing peripheral nerve blocks.

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DEDICATION

I would first like to thank God for the grace and mercy that he has shown me throughout one of the most challenging periods of my life. I would also like to thank my wife for the love and support she has shown me throughout this program. Without her words of encouragement and prayers, none of this would have been possible. I would like to dedicate this project to my wife and two beautiful girls.

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LIST OF ABBREVIATIONS

| | |
|-------------|---|
| <i>ASA</i> | American Society of Anesthesiologist |
| <i>CRNA</i> | Certified Registered Nurse Anesthetist |
| <i>DNP</i> | Doctorate of Nursing Practice |
| <i>IASP</i> | International Association for the Study of Pain |
| <i>IOM</i> | Institute of Medicine |
| <i>IRB</i> | Institutional Review Board |
| <i>ISB</i> | Interscalene Brachial Plexus Block |

CHAPTER I - INTRODUCTION

Background and Significance

Approximately 75 million surgical procedures are performed in the United States each year. More than half of these procedures are performed in the inpatient setting (Macres, Moore, & Fishman, 2013). There have been many advances in the management of post-operative pain control but significant deficits continue to persist. The treatment of acute post-operative pain has still managed to be less than optimal (Macres, Moore, & Fishman, 2013). One of the major concerns in relation to general surgery is pain in the post-operative phase. Unrelieved pain can have detrimental effects on a patient's physical and psychological well-being and can lead to a slower recovery time (Macres, Moore, & Fishman, 2013). Some of the immediate consequences of severe acute pain includes reduced mobility, disturbed sleep patterns, dependence on pain relieving medications, and immune system impairment which increases a patient's susceptibility to infection (Brennan et al., 2007). Pain is said to be a universal experience that is unique to each individual person. Research shows that poorly managed pain after surgery can produce a pathophysiologic process in both the peripheral nervous system and central nervous systems. This acute surgical pain has the potential to produce chronicity which can lead to long term negative consequences (Macres, Moore, & Fishman, 2013). In cases where chronic pain develops, a patient's central nervous system can become hypersensitive. This increased sensitivity could lead to an increased pain response to where it would normally not be as painful (Institute of Medicine [IOM], 2011).

Problem Statement/Needs Assessment

The economic cost of chronic pain in adults is \$560-630 billion annually. This economic cost is according to a study done for the IOM Committee on Advancing Pain Research, Care, and Education (IOM, 2011). Post-operative pain creates burdens for the patient and their family members while also increasing costs to the healthcare system. Postoperative pain remains as a major problem in surgical patients. Pain that is experienced post-operatively is often masked by a patient's acceptance of pain as a natural consequence of surgery (Macres, Moore, & Fishman, 2013). In a study released by the IOM, 80% of patients undergoing surgery experienced pain post-operatively. Of this 80%, fewer than half reported adequate pain relief. Furthermore, 10 to 50% of the patients with pain after surgery develop chronic pain. The development of chronic pain largely depends on the type of surgery the patient has undergone. It goes on to state that 2 to 10% of these patients rate their chronic postoperative pain as severe (IOM, 2011). Inadequate pain relief after surgery may decrease patient satisfaction while increasing the length of hospital stay. Pain can delay surgical recovery, increase the cost of overall healthcare, and raise the risk of hospital readmissions (Patacsil, 2016).

Acute pain is defined as "the normal, predicted, physiologic response to and adverse chemical, thermal, or mechanical stimulus." (Macres, Moore, & Fishman, 2013. p.1612). The International Association for the Study of Pain (IASP) states that pain is an unpleasant sensory and emotional experience. It can be associated with actual or potential tissue damage (IASP, p. 209-214). The definition provided by this association recognizes the interplay between the objective, physiological sensory aspects of pain. It also recognizes the emotional, subjective, and psychological components of pain as well. The

response to pain among different individuals can be highly variable as well as in the same person just at different times (Rosenquist & Vrooman, 2013). In 2012, the American Society of Anesthesiologist (ASA) released an update to its Practice Guidelines for Acute Pain Management in the Perioperative Setting. In the updated report, the ASA strongly recommends the use of a multi-modal approach to pain management when possible (ASA, 2012). There has been an increase in support of the use of peripheral nerve blocks by anesthesia providers (Kirksey, Haskins, Cheng, & Liu, 2015). This rise in support may help to decrease the amount of pain that is experienced in the immediate post-operative phase of surgery (Patacsil, 2016).

Acute post-operative pain is often times associated with a neuroendocrine response that is proportional to pain intensity and leads to the release of catecholamines from the adrenal medulla (Rosenquist & Vrooman, 2013). The release of catecholamines is a hormonal response that is a result of the increase in sympathetic tone. Moderate to severe pain can adversely affect the function of nearly every organ in the human body and may lead to negative perioperative outcomes such as myocardial ischemia, respiratory distress, constipation, and infection. These negative outcomes may adversely affect the perioperative morbidity and mortality rates (Rosenquist & Vrooman, 2013). The cardiovascular effects of pain are often times exhibited as hypertension, enhanced myocardial irritability, tachycardia, and an increase in systemic vascular resistance. These systemic effects can result in myocardial ischemia if it is not resolved due to an increase in oxygen demand and a decrease in the supply of oxygen (Rosenquist & Vrooman, 2013). Post-operative pain may also negatively affect the respiratory system when there is an increase in total body oxygen consumption and carbon dioxide

production that requires an increase in a patient's respiratory rate. This rise in minute ventilation causes an increase in the work of breathing, especially in those patients with an underlying respiratory disease (Rosenquist & Vrooman, 2013). Pain may also negatively affect the gastrointestinal and urinary system by increasing sphincter tone, decreasing intestinal and urinary motility which promotes urinary retention (Rosenquist & Vrooman, 2015). The effects on the gastrointestinal tract are due to the physiological stress that pain places on the body and the increase in sympathetic tone (Rosenquist & Vrooman, 2013). The neuroendocrine stress response can depress the reticuloendothelial system which can predispose a patient to infection and may also enhance tumor growth and metastasis (Rosenquist & Vrooman, 2013). Lastly, pain can produce negative psychological effects such as sleep disturbances and anxiety, which are often times common reactions to acute post-operative pain. If this becomes a prolonged response, depression may develop. Unrelieved pain may lead to frustration and anger that can be directed at healthcare providers, family, and friends (Rosenquist & Vrooman, 2013). As mentioned earlier, there are many ways to treat and prevent post-operative pain. The widespread negative effects that pain has on the body post-operatively can prolong the recovery phase and must be treated appropriately.

Regional anesthesia can provide potent analgesia that may lead to a reduction in the stress response that is often times exhibited with surgery. Peripheral nerve blocks are a form of regional anesthesia that can reduce systemic opioid requirements and their side effects, general anesthesia requirements, and possibly the incidence of chronic post-operative pain. (Madison & Iifeld, 2015). Single-injection peripheral nerve blockade using local anesthetics has been shown to provide patients with pain control that is

superior to that of just opioids while leaving the patient with fewer side effects (Lin & Liu, 2013).

The administration of local anesthetics blocks the conduction of impulses in electrically excitable tissues (Lin & Liu, 2013). One of the most important uses of peripheral nerve blocks is to provide analgesia and anesthesia by blocking the transmission of pain along the nerve fibers (Lin & Liu, 2013). Electrical impulses are conducted along nerve fibers as action potentials. An action potential is a brief, localized spike of positive charge along the nerve that is caused by a rapid influx of sodium ions down its electrochemical gradient. The flow of this sodium ion is mediated by a pump that is known as the voltage-gated sodium channel (Lin & Liu, 2013).

Local anesthetics work by blocking the transmission of nerve impulses. This is achieved by targeting the function of voltage-gated sodium channels. Local anesthetics reversibly bind to the intra-cellular portion of the voltage-gated sodium channel, therefore inhibiting the action potential (Lin & Liu, 2013). Both the volume of the local anesthetic along with the concentration determine the degree of nerve blockade (Nagelhout & Plaus, 2014). By blocking this action potential, the nerve is unable to perform its function which results in the inhibition of pain.

Due to the increase in support of peripheral nerve blocks, there has been a decrease in the amount of pain that is experienced by the patient (Desmet, et al., 2013). Several adjunct medications can be added to local anesthetics when performing peripheral nerve blocks. These adjuncts often times allow for longer periods of pain relief post-operatively. The addition of dexamethasone intravenously prior to peripheral nerve blocks for the purpose of prolonging analgesia was the focus of this DNP project. The

administration of dexamethasone prior to peripheral nerve blocks has not been a common practice in the clinical sites that I have rotated through. Therefore, the goal for this DNP project is to gather and provide information in regards to dexamethasone and the effect that it has on post-operative pain relief in hopes of achieving a change of practice.

Dexamethasone is metabolized in the liver via cytochrome P-450 enzymes. There have been no reports of adverse effects of a single injection of dexamethasone. But, patients who are sensitive to steroid administration, such as patients with diabetes, should be given the drug with caution. Steroids have the potential to increase blood glucose levels at larger doses (Nagelhout & Plaus, 2014). Another advantage related to the administration of dexamethasone besides the prolong duration of analgesia is that it has been found to be an effective treatment for the reduction of post-operative nausea and vomiting (Nagelhout & Plaus, 2014).

Clinical Question

The clinical question for this project was used to determine whether or not a change of practice has occurred. The question is: Are certified registered nurse anesthetists (CRNAs), who are provided evidence based research, willing to administer dexamethasone intravenously prior to performing peripheral nerve blocks in an attempt to prolong the duration of action of local anesthetics? The answer to this question will be determined by comparing a pre-intervention survey to a post-intervention survey after an evidence based presentation is provided.

Recent studies show that potent glucocorticoid injections via the perineural route prolong the conduction block after peripheral nerve block application (Bailard, Ortiz & Flores, 2014). A large meta-analysis of the analgesic effects of intravenous

dexamethasone for postoperative pain indicated that this route was as effective in decreasing pain at rest, with movement, and opioid consumption (Bailard, Ortiz & Flores, 2014). The duration of the blockade is associated with the potency of the glucocorticoid activity and appears to be steroid receptor dependent and locally mediated (Martinez & Fletcher, 2014). Dexamethasone is a glucocorticoid agonist that is often times generally indicated for its anti-inflammatory and anti-emetic effects. Dexamethasone has the ability to cross the cell membrane and binds to specific cytoplasmic receptors. This ability to cross cell membranes results in leukocyte infiltration interference at the site of inflammation and other inflammatory mediators are inhibited which leads to a reduction in edema or scar tissue while also suppressing the humoral immune response (Patacsil, 2016). The anti-inflammatory actions of this particular drug are thought to involve the inhibition of phospholipase A2, lipocortins. These lipocortins are responsible for the control of the biosynthesis of potent mediators of inflammation such as prostaglandins and leukotrienes. Once this drug has crossed the lipid-bilayer, it binds in the cytoplasm with glucocorticoid receptors and moves into the nucleus (Patacsil, 2016). It has been demonstrated that corticosteroids inhibit signal transmission of nociceptive C-fibers, decrease ectopic neuronal discharge, and decrease the release of local inflammatory mediators (Patacsil, 2016). The inhibition of the pain signal decreases the perception of noxious stimuli from the periphery.

Purpose of the Project

The primary purpose of this DNP project was to propose a practice change to include the use of dexamethasone intravenously prior to performing a peripheral nerve block. The secondary goal of this DNP project was to improve postoperative outcomes in

surgical patients by providing longer periods of pain relief. Research shows that administering dexamethasone intravenously prior to peripheral nerve blocks will prolong the duration of sensory blockade and thus reduce the amount of post-operative pain that is experienced by the patient. This practice change was expected to improve patient satisfaction in the clinical setting, reduce hospital costs, and improve overall surgical experience as previously stated. According to a report from the IOM, pain continues to be a significant health problem that costs society at least \$560-\$635 billion annually (IOM, 2011). While in the clinical setting, an informal poll was provided to practicing CRNAs, and it was determined that very few were aware of the effects of dexamethasone on peripheral nerve blocks when given the intravenous route. The main goal for this project was to educate anesthesia providers on the effectiveness of intravenous dexamethasone on peripheral nerve blocks and to encourage a change of practice as to where this becomes a mainstay in the way that peripheral nerve blocks are performed. Some benefits of this implementation is the improved physiological and psychological effects on the patient population, decreased recovery time post-operatively leading to a shorter hospital stay, decreased risk of hospital readmissions, and decreased overall healthcare costs.

Evidence was provided via this project to encourage a practice change to include the use of intravenous dexamethasone when performing peripheral nerve blocks. A potential strength of this project is that hospital costs may be reduced due to the decreased recovery time that is experienced post-operatively. Patient satisfaction is improved due to lower incidences of post-operative pain as well as decreased occurrences of post-operative nausea and vomiting. A potential weakness of this type of project was that some anesthesia providers are unwilling to change the way that they administer

anesthesia due to the fact that they have had great success with the way that they have performed peripheral nerve blocks in the past. It is important that up to date evidence based practice is presented to clinical providers due to the ever changing healthcare setting. This new information will help to ensure that the best care can be provided to the patient population based off of the research that is available.

Review of Literature

The following section is a narrative review of literature concerning the use of intravenous dexamethasone to prolong the duration of action of local anesthetics when peripheral nerve blocks have been administered. The online databases used to search for articles related to the clinical question at hand were CINAHL, PubMed, and Google Scholar. The terms *intravenous*, *dexamethasone*, *adjuncts*, and *peripheral nerve blocks* were used interchangeably with results that were limited to within the last 10 years. A total 292 articles were found using the combination of these search terms. Five articles were chosen to be used exclusively for the literature review. Several scholastic anesthesia textbooks along with scholarly articles were utilized for the literature review in regards to this DNP project

Some additives to local anesthetics can hasten the onset of nerve blocks, prolong block duration, or reduce toxicity (Bailard, Ortiz & Flores, 2014). A clinical review by Bailard, Ortiz, and Flores (2014) evaluated additives to local anesthetics for peripheral nerve blocks to gather evidence and determine limitations. The purpose of this review was to determine the clinical effectiveness and potential adverse effects of some common medications that are often times used in combination with local anesthetics for regional anesthesia. The clinical review compared the use of additive to local anesthetics for

peripheral nerve blocks and helped to establish evidence, limitations, and recommendations for the adjunct in question. One hundred and fifty patients undergoing interscalene brachial plexus block with ropivacaine hydrochloride for shoulder surgery were randomly assigned. The first group received a placebo, another group 10 mg of dexamethasone perineurally, and the third 10 mg dexamethasone intravenously. The results were established by determining the mean duration of analgesia after surgery. It was found that the administration of dexamethasone by either route nearly doubled the median duration of analgesia provided by the local anesthetic. The median duration of analgesia was found to be 1405 minutes when administered perineurally and 1275 minutes when administered intravenously. The median time of analgesia was found to only be 757 minutes when dexamethasone was withheld and ropivacaine was the only drug administered.

An interscalene brachial plexus block (ISB) is a type of peripheral nerve block that provides excellent analgesia for upper extremity surgery but it is time-limited (Desmet, et al., 2013). A comparison of intravenous and perineural dexamethasone administration when performing a single-shot interscalene block was examined by Desmet, et al., (2013). The researchers stated that dexamethasone added to local anesthetics would prolong the duration of a single-shot ISB. A double-blind placebo-controlled study was performed on patients that were undergoing an arthroscopic shoulder surgery. The subjects were then randomly separated into three different groups. The first group received ropivacaine 0.5% alone. The second group received ropivacaine 0.5% and dexamethasone 10 mg along with the local anesthetic. The final group received ropivacaine 0.5% with intravenous dexamethasone at 10 mg. The duration of analgesia,

which was defined as the time between the administration of the block and the first analgesic request, was the primary outcome that was measured. One hundred and fifty patients were included in the study after an ethical committee approval was obtained along with patient informed consent. There was a significant difference between those that received just ropivacaine which had a duration of action of 757 minutes compared to the dexamethasone groups which had a mean duration of 1405 (perineurally) and 1275 (intravenously) ($p = 0.0001$). The study concluded with stating that due to the fact that dexamethasone is not FDA approved for perineural use, clinicians should consider administering dexamethasone intravenously as opposed to perineurally. This route of administration is due to its equivalency when compared to perineural administration to achieve an increase in duration of ISB (Desmet et al., 2013).

A recent large meta-analysis, performed by De Oliveira, Almeida, Benzon, and McCarthy (2011), of the analgesic effect of intravenous single-dose dexamethasone for post-operative pain indicated that doses of greater than 0.1 mg/kg are effective in decreasing pain and opioid consumption. It is possible that some of the analgesia-prolonging effect of perineural dexamethasone could be achieved by intravenous administration (De Oliveira, Almeida, Benzon & McCarthy, 2011). Three groups were divided up in this study to determine the effects of dexamethasone at different dosages. There was a low dose group which received less than 0.1 mg/kg. There was an intermediate group which received 0.11-0.2 mg/kg and lastly a high dose group that received > 0.21 mg/kg. The authors stated that the mean combined effects favored dexamethasone over placebo for pain at rest and with movement. It was noted that opioid consumption was decreased to a similar extent with moderate and high doses of

the dexamethasone. Opioid consumption was not decreased with the low-dose dexamethasone administration in this study. Furthermore, it was determined that there was no increase in effectiveness between the high dose and intermediate dose of dexamethasone. The administration of dexamethasone in the pre-operative phase appears to be more effective when compared to the administration of this drug in the intra-operative phase. The authors concluded that dexamethasone at doses of 0.1 mg/kg or greater is an effective drug in reducing postoperative pain and opioid consumption after surgery. The preoperative administration of the drug worked more effectively and produced less variation in pain control outcomes. The meta-analysis revealed that an intermediate-dose of dexamethasone reduced the amount of opioids needed post-operatively to reduce pain. High dose dexamethasone administration had opioid sparing effects while also decreasing pain scores which can be attributed to its analgesic properties.

Dexamethasone has been shown to have powerful anti-inflammatory action and has demonstrated the ability to reduce morbidity after surgery (Hong, Han, Kim, E., Kim, J. & Kil, 2010). A study by Hong, et al., (2010) was performed to determine and examine the effects of a single dose of intravenous dexamethasone in combination with a caudal block on postoperative analgesia in children. Seventy-seven children between the ages of 1-5 years old undergoing an orchiopexy procedure were included in this study. The two different groups of children either received dexamethasone at 0.5 mg/kg or the same volume of saline before a caudal anesthetic block was performed. The caudal was performed using 1.5 mL/kg of ropivacaine 0.15% in all of the patients. Pain scores, analgesic consumption, and adverse effects were all evaluated for the first 24

hours following surgery. The authors stated that fewer patients in the dexamethasone group required opioids for analgesia in the post anesthesia care unit. The results of this study showed that only 7.9% of the patients that received dexamethasone required fentanyl for analgesia. Of the patients who did not receive dexamethasone with their block, 38.5% required additional fentanyl for pain relief. The time to the first administration of acetaminophen was significantly longer in the dexamethasone group (646 minutes versus 430 minutes) showing that those who received dexamethasone with their peripheral nerve block had longer periods of pain relief. The postoperative pain score was lower in the group of children who received dexamethasone prior to the regional block. In conclusion, intravenous dexamethasone at 0.5 mg/kg in combination with a caudal block augments the duration and intensity of the postoperative analgesia that is experienced by children.

A trial determining the effects of intravenous dexamethasone and perineural dexamethasone was performed by Abdallah, Johnson, Murgatroyd, Ghafari, Ami, Jin and Brull (2015). This study determined how the two routes similarly prolonged the duration of analgesia after a supraclavicular brachial plexus block was performed. The ultimate purpose of this study was to confirm that the addition of intravenous dexamethasone would prolong the duration of analgesia after a single-shot injection supraclavicular block was performed. They compared the intravenous administration of dexamethasone with the conventional local anesthetic alone or in combination with perineural dexamethasone for surgeries on the upper extremity of patients. In this study, 75 patients who were receiving a supraclavicular block were placed randomly into three different groups. The first group received 30 mL of 0.5% bupivacaine alone, the second group received

intravenous dexamethasone at a dose of 8mg, and the third group received perineural dexamethasone at 8 mg. Pain scores, opioid consumption, motor block duration, patient satisfaction, and block related complications were all analyzed for this study. The duration of analgesia was prolonged in the intravenous group when compared to the control group but similar to the group that received dexamethasone perineurally. It was determined that the duration of analgesia was prolonged in the group that received intravenous dexamethasone and perineural dexamethasone (25 hours) compared to the group that just received bupivacaine (13.2 hours). The intravenous and perineural dexamethasone groups both had reduced pain scores, improved satisfaction, and reduced postoperative pain control in comparison to the local anesthetic alone group. The researchers stated that with a supraclavicular block, the effectiveness of intravenous dexamethasone in prolonging the duration of analgesia seems to be very similar to that of perineural dexamethasone administration (Abdallah, et al., 2015). This conclusion is a significant finding for this DNP project due to the equivalency of action that intravenous dexamethasone shows when compared to that of perineural dexamethasone.

Conclusion

The treatment of acute post-operative pain is still less than optimal (Macres, Moore, & Fishman, 2013). Some of the immediate consequences of severe acute pain include loss of strength, reduced mobility, a disruption in sleep patterns, immune system impairment which could increase susceptibility to disease and infection, and dependence on opioids (Brennan et al., 2007). Due to the increasing use of peripheral nerve blocks, it is important to continue research and education in this area of health care to promote better patient outcomes and improve overall surgical satisfaction. From the literature

review, it was determined that dexamethasone, when administered intravenously prior to performing peripheral nerve blocks, was effective at prolonging the period of analgesia post-operatively.

Doctor of Nursing Practice Essentials

The DNP essentials that were incorporated in this project can be found in Appendix F. All essentials were met upon completion of this project and a brief explanation of each is provided in the table. Emphasis was placed on essential I, II, and VIII which were most closely related to this project

Theoretical Framework

There has been a tremendous increase in the amount of clinical based research and its contribution to evidence based practice. The accessibility to this research has been made extremely easy due to the advancements of technology. Despite the advancement of technology, practitioners continue to have difficulty implementing the latest evidence based research and integrating it into practice (Rosswurm & Larrabee, 1999). The Nursing Intellectual Capital Theory was chosen as a basis for this DNP project. This theory states that the nursing structural capital is directly related to the quality of care in the healthcare setting. The theory of nursing intellectual capital proposes nurses' knowledge, experience, and skills are related to patient outcomes. These outcomes are often times associated with the quality of care that is provided in the healthcare setting. It is also associated with the organizational outcomes in relation to recruitment and retention of nurses (Covell & Sidani, 2013).

Nursing intellectual capital is defined as the knowledge translated into organizational and personnel performance (Covell & Sidani, 2013). The goal was to

implement the latest evidence based research into practice by administering intravenous dexamethasone prior to peripheral nerve blocks in an attempt to prolong the duration of pain relief. *Nursing performance* can lead to improvements in patient outcomes associated with quality of patient care (Covell & Sidani, 2013). The results of the implementation of this suggested a change of practice could possibly lead to a decrease in adverse events in the perioperative setting. This change of practice would mean a decrease in the amount of postoperative pain that is experienced, which may result in an increase in patient satisfaction and well-being and a decrease in hospital length of stay. The purpose of *organizational performance* was to improve organizational outcomes. These are the cost-related outcomes associated with retention of knowledge and the recruitment of experienced nurses (Covell & Sidani, 2013). *Nursing human capital* is defined as the knowledge, skills, and experience of nurses. Through continued education, the goal of this doctoral project was to propose a practice change for the usage of dexamethasone intravenously prior to peripheral nerve blocks. This type of nursing capital was implemented by the anesthesia providers at a level 2 hospital in the southeastern United States. *Nursing structural capital* are the resources which contain nursing knowledge. This capital is used to support registered nurses in the application of their knowledge in the clinical setting. It is also attributed to the skills they provide to healthcare consumers. This type of capital can be structured as practice guidelines and information technology for diagnostic purposes (Covell & Sidani, 2013). The research gathered for this project was presented to the anesthesia providers. The research that was presented could lead to the creation of a protocol or practice guideline to create structural capital in the healthcare environment. *Nurse staffing* is defined as the supply and the mix

of nurses who possess the knowledge, skills, and experience to competently meet the care needs of patients on the unit (Covell & Sidani, 2013).

Summary

The implementation of the latest evidence based research directly effects the quality of care that is provided in the healthcare setting. The nursing intellectual theory that was chosen for this project directly relates how the latest research can influence the way that healthcare is practiced. By implementing the nursing intellectual capital theory, there was an increase in the quality of care that was provided by improving nurses' knowledge, skills, and experience.

CHAPTER II – METHODOLOGY

Overview

The purpose of this doctoral project was to encourage a practice change of anesthesia providers implementing the administration of dexamethasone intravenously prior to performing peripheral nerve blocks to prolong the duration of action of the local anesthetic and provide longer periods of analgesia. The literature review helped establish the importance of postoperative pain relief and the benefits of administering dexamethasone when performing peripheral nerve blocks. The primary goal of this doctoral project was to provide evidence-based research to anesthesia providers in order to encourage a change of practice. Improving patient outcomes by administering dexamethasone intravenously along with peripheral nerve blocks fulfilled the secondary goal of this doctoral project. This improvement came at minimal increased effort to the practitioner due to the fact that dexamethasone is often times given at the beginning of procedures for the anti-emetic qualities that it possesses. Wang, Ho, Tzeng and Tang (2000) found that dexamethasone, when given prior to the induction of anesthesia was more effective at preventing nausea and vomiting than when administered in the post-operative or intra-operative phase of surgery.

Target Population

The participants for this doctoral project were all anesthesia providers employed at a 512 bed inpatient facility in the southeastern portion of the United States. This facility offers a wide range of surgical services that include: neurosurgery, cardiothoracic, general, obstetrics, trauma, ear/nose/throat, orthopedic, and reconstructive. The inclusion criteria for participants are anesthesia providers who are

licensed and certified at this facility. The participants of this project were either full-time or part-time employees when the intervention is being conducted. There was no random selection among the participants. Exclusion criteria included anesthesia providers who do not perform peripheral nerve blocks, surgeons, and any other employee of the facility who does not directly administer anesthesia. Those providers who chose not to participate were also excluded from the project.

Protection of Human Subjects

Institutional Review Board (IRB) approval was obtained from The University of Southern Mississippi (Protocol number 17080302) and the participating facility's Nursing Research Council. The committee chair, committee members, and the author of the project had completed the required CITI Common Course Training module. Participants in this DNP project were kept anonymous by allowing the participants to choose whether or not they wanted to participate in the project. The data collection process was completed 2 weeks after the initial evidence based presentation was provided. A lock box was left at the facility in order for the participants to return their completed post-presentation surveys. The key to this lock box was kept in a secure place where only the author of this project had access. All data collected from this project will be deleted and/or shredded 6 months after all graduation requirements are met and completed. All participants maintained anonymity and were able to decide whether or not they choose to partake in the project. There were several potential benefits to this DNP project which included a possible increase in patient safety, decreased financial burden on the patient and facility, and improved patient satisfaction. There were no physiologic or psychological threats associated with this quality improvement project.

Design of Measurement Tools

A quality improvement educational presentation was held for the participating anesthesia providers at the chosen facility during operational hours. The evidence-based presentation was compiled from scholastic anesthesia textbooks as well as the literature review. The participating anesthesia providers were asked to complete a survey prior to the presentation (Appendix A). This survey was used to assess whether or not the participating anesthesia providers use dexamethasone in conjunction with peripheral nerve block administration. If they currently did so, it was then determined whether or not it is administered before, during, or after performing the block. It was also determined through this survey whether or not they administer dexamethasone intravenously or perineurally. Barriers to implementation and the frequency in which they perform peripheral nerve blocks were also determined. The survey was also used to determine the age, and gender of the participant as well as the length of time they have been practicing. The participants were informed that they were providing consent to participate in the doctoral project by filling out the questionnaire. Surveys were collected and the data was analyzed using descriptive statistics.

After 2 weeks elapsed, another survey was given to the anesthesia providers that chose to participate in the DNP project (Appendix B). This survey was used to determine whether or not the anesthesia providers administered intravenous dexamethasone prior to the peripheral nerve blocks that they performed after the evidence-based presentation was provided to them. It was also determined whether or not the evidence-based presentation influenced their willingness to administer dexamethasone when performing peripheral

nerve blocks. Descriptive statistics was used to compare the results of the initial survey and the second survey to determine if anesthesia providers changed their practice.

Assumptions

An assumption of this project was that post-operative pain control needed to be improved upon in the hospital setting. Another assumption of the project was that the anesthesia providers at this facility were not currently up to date on the latest literature in regards to the administration of dexamethasone intravenously prior to peripheral nerve blocks. The final assumption of this project was the willingness of the current anesthesia providers to participate.

Resource Requirements

A location in the southeastern portion of the United States was needed for the project as well as anesthesia staff to participate in the project. The physical resources needed for this included paper and ink for the pre and post questionnaires. A data collection lock box was needed for the post presentation questionnaires to be returned. The availability of dexamethasone, local anesthetics, and peripheral nerve block administration equipment was also needed.

Summary

Implementing the administration of intravenous dexamethasone prior to peripheral nerve blocks required the participation of anesthesia providers as well as different physical resources. These physical resources were readily available at the chosen facility. The anesthesia providers who chose to participate in the project were also available the day of the intervention. After the evidence based presentation was provided to the providers and the 2-week data collection process was completed, descriptive

statistics was used to determine if the participating anesthesia providers began to administer dexamethasone intravenously prior to performing peripheral nerve blocks.

CHAPTER III - RESULTS

Overview

On the day of the presentation, a pre-intervention questionnaire was given to anesthesia providers. This survey was used to gather demographic information on the anesthesia providers and it was also used to determine whether or not dexamethasone was being administered along with their peripheral nerve blocks. Upon completion of the survey, an evidence-based presentation was then provided via a power point presentation. After completion of the presentation, the anesthesia providers were then informed of the data collection box that would be used to return a second survey after 2 weeks had elapsed. Upon completion of the two-week data collection period, the surveys were then collected and stored in a secure location that only the author had access to. The post-intervention survey was used to assess whether or not anesthesia providers began administering dexamethasone intravenously prior to peripheral nerve blocks based on the presentation that was provided on the day of the intervention.

Statistical Analysis of Data

The primary goal of this project was to propose a practice change to where dexamethasone would be administered intravenously prior to performing peripheral nerve blocks in order to prolong the period of analgesia for patients undergoing surgery. There were seven anesthesia providers who participated in the presentation and filled out the pre-intervention survey. Descriptive statistics were then used to describe the participants of the project and a frequency count was then used to determine if a practice change had occurred over the two-week data collection period. All seven of the participants in the project were males whose ages ranged between 31 and 59. The years of experience in

practicing anesthesia ranged between 1 and 33. The number of peripheral nerve blocks performed by the participating anesthesia providers ranged from 4 to 20 per month. According to the pre-intervention survey, four of the seven participants administered dexamethasone. Of these four, two of the participants were administering dexamethasone perineurally and the other two were using both the intravenous and perineural route. The other three participants indicated that they were not administering dexamethasone when performing peripheral nerve blocks.

Of the seven participants who completed the pre-intervention survey, six of them completed the post-intervention survey once the 2 weeks of the data collection process had ended. Five out of the six participants revealed that the evidence-based intervention influenced their decision to administer dexamethasone intravenously when performing peripheral nerve blocks. One of the participants denoted that he still does not administer dexamethasone when performing peripheral nerve blocks. Of the five participants who administer dexamethasone with peripheral nerve blocks, three of them indicated they administer the drug both the perineural and intravenous route while the other two indicated they began administering the drug intravenously.

Summary

It was determined that a change of practice had occurred due to the results of the post-intervention survey. The administration of dexamethasone intravenously was being implemented by a majority of the participants in the project. The change of practice that occurred at this facility could potentially improve the quality of care provided based on of the information that was provided.

CHAPTER IV – DISCUSSION

Implications

As a result of the intervention, there was an increase in the administration of dexamethasone prior to peripheral nerve blocks via the intravenous route. Five participants revealed they utilized dexamethasone when performing peripheral nerve blocks. A majority of the participants in the project began utilizing dexamethasone intravenously when performing peripheral nerve blocks. Only one of the six participants who returned the post intervention survey revealed he did not begin implementing the use of dexamethasone with nerve blocks. As a result of the DNP project, a change of practice did occur as evidenced by the results of the post-intervention survey. Five out of the six participants denoted the evidence-based presentation influenced their decision to begin administering dexamethasone intravenously when performing peripheral nerve blocks.

Limitations and Barriers

A limitation to this study was the small sample size from which the data collection was obtained. There were also limited responses to the project, which made it more difficult to draw conclusions from the information that was provided. Also, the reduced data collection time period was a limitation to the study and the results. There were only a limited number of peripheral nerve blocks that could be performed in the 2-week data collection process.

Recommendations

Quality improvement educational projects regarding this topic would be beneficial for the facility in which the project took place. A larger sample size along with a longer data collection window would allow for results that could provide greater detail

about whether or not there is an interest in a proposed change of practice. Presenting the data over a longer period could have potentially led to an increase in the implementation of dexamethasone intravenously prior to peripheral nerve blocks.

Conclusion

After the intervention, there was an increase in the number of providers who administered dexamethasone intravenously when performing peripheral nerve blocks. Literature supports the administration of dexamethasone intravenously prior to performing peripheral nerve blocks in order to prolong the period of analgesia. The goal of this study was to propose a practice change in order to decrease the amount of pain that is experienced in the post-operative phase of surgery. This change of practice would improve the quality of care provided to patients, which in turn would increase patient satisfaction while lowering hospital costs.

APPENDIX A – Pre-Intervention Survey

Pre-Intervention Survey

By agreeing to fill out this survey you are consenting to participate in this project. You are not required to participate and may withdraw at any time without penalty. If you have any questions you may contact me (Jacob.millwood@usm.edu) or Dr. Marjorie-Everson (Marjorie.geiszeverson@usm.edu).

- 1) What is your age?

- 2) What is your gender?
 - a. Male
 - b. Female
- 3) How many years have you been practicing anesthesia?

- 4) How often do you administer peripheral nerve blocks in a month?

- 5) Do you currently administer dexamethasone in conjunction with your peripheral nerve blocks?
 - a. Yes
 - b. No
- 6) If you currently administer dexamethasone for nerve blocks, which route is chosen?
 - a. Perineurally
 - b. Intravenously
- 7) If you answered yes to administering dexamethasone, when do you administer it in relation to the the nerve block?
 - a. Before
 - b. During
 - c. After

APPENDIX B – Post-Intervention Survey

Post Intervention Survey

By agreeing to fill out this survey you are consenting to participate in this project. You are not required to participate and may withdraw at any time without penalty. If you have any questions you may contact me (Jacob.millwood@usm.edu) or Dr. Marjorie-Everson (Marjorie.geiszeverson@usm.edu).

- 1) What is your age range?

- 2) What is your gender?
 - a. Male
 - b. Female
- 3) How many years have you been practicing anesthesia?

- 4) How often do you administer peripheral nerve blocks in a month?

- 5) Do you currently administer dexamethasone in conjunction with your peripheral nerve blocks?
 - a. Yes
 - b. No
- 6) If you currently administer dexamethasone for nerve blocks, which route is chosen?
 - a. Perineurally
 - b. Intravenously
- 7) If you answered yes to administering dexamethasone, when do you administer it in relation to the the nerve block?
 - a. Before
 - b. During
 - c. After
- 8) Did the evidence-based presentation influence your decision to administer dexamethasone intravenously prior to performing peripheral nerve blocks?
 - a. Yes
 - b. No

APPENDIX C – IRB Approval Letter



INSTITUTIONAL REVIEW BOARD

118 College Drive #5147 | Hattiesburg, MS 39406-0001 | Phone: 601.266.5997 | Fax: 601.266.4377 |

www.usm.edu/research/institutional.review.board

NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months. Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 17080302

PROJECT TITLE: Administering Dexamethasone Intravenously Prior to Performing Peripheral Nerve Blocks

PROJECT TYPE: New Project

RESEARCHER(S): Jacob Daniel Millwood

COLLEGE/DIVISION: College of Nursing

DEPARTMENT: Advanced Practice

IRB COMMITTEE ACTION: Exempt Review Approval

PERIOD OF APPROVAL: 08/07/2017 to 08/06/2018

Lawrence A. Hosman, Ph.D. Institutional Review Board

APPENDIX D – Letter of Agreement

RESEARCH PROPOSAL LETTER OF AGREEMENT

TO: Jacob Millwood
FROM: Research Committee
RE: Proposed project/study entitled: Administering Dexamethasone Intravenously Prior to Performing Peripheral Nerve Blocks

On August 8, 2017 your research project/study proposal was approved by the Nurse Practice Council to be conducted within Patient Care Services at [REDACTED]. You are free to proceed with your project/study within the following guidelines:

1. You are required to complete an online non-employee orientation that is administered through our Education Department (601-288-2677).
2. A *Non-Employee Confidentiality and Nondisclosure Agreement* must be signed during the online orientation process.
3. Any modifications to this approved study must be re-routed to the Research Committee. All activity on this project must stop until you are notified by the Research Committee Chair of Committee's decision regarding proposed changes
4. Data Collection Period:
5. Inform Research Chair when data collection is initiated and when completed (via e-mail)
6. Provide results of study to committee (may provide presentation or written documentation of findings)

Sincerely,

[REDACTED]

I, [REDACTED], have reviewed the above guidelines and agree to comply with the terms of this *Research Proposal Letter of Agreement*.

Signature: [REDACTED] Date: 8/16/2017

APPENDIX E – Letter of Support

Letter of Support

July 5, 2017

I, [REDACTED], support Jacob Millwood's DNP project to propose a practice change to implement the administration of dexamethasone intravenously prior to performing peripheral nerve blocks.

Sincerely,

[REDACTED]

[REDACTED]

APPENDIX F –DNP Essentials

- **Essential 1: Scientific Underpinnings for Practice**

- *This DNP project describes strategies that encourage a change of practice that in turn help to decrease post-operative pain which can lead to an increase in patient satisfaction and outcomes.*
- *The latest evidence based research was gathered to further improve the healthcare environment and improve patient safety.*

- **Essential 2: Organizational and Systems Leadership for Quality Improvement and Systems Thinking**

- *This DNP project evaluates a care delivery system through the administration of dexamethasone intravenously prior to peripheral nerve blocks to prolong the duration of action of the local anesthetic to improve patient outcomes for the undergoing surgery.*
- *Improving patient outcomes by demonstrating strong leadership skills is a part of the foundation of this research project.*

- **Essential 3: Clinical Scholarship and Analytical Methods for Evidence-Based Practice**

- *This DNP project used analytical methods to appraise existing research of the effects of administering dexamethasone to reduce post-operative pain.*
- *An in-service was developed in an attempt to educate practicing anesthesia providers for the improvement of post-operative pain control through the administration of dexamethasone intravenously prior to peripheral nerve blocks.*

| |
|--|
| <ul style="list-style-type: none"> • Essential 4: Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Health Care. • <i>This DNP project demonstrates an effective ability to implement and execute an evaluation plan for the use of dexamethasone and peripheral nerve blocks by anesthesia providers.</i> • <i>Electronic databases were used to allocate evidence-based research for the administration of intravenous dexamethasone and the role that this plays on peripheral nerve block prolongation.</i> |
| <ul style="list-style-type: none"> • Essential 5: Health Care Policy for Advocacy in Health Care • <i>This DNP project may improve healthcare related outcomes for patients that are receiving peripheral nerve blocks by developing, evaluating, and providing leadership to encourage a change in the way providers practice.</i> • <i>Knowledge of advanced practice nursing will be exemplified through implementing the change of practice to improve patient outcomes and safety.</i> |
| <ul style="list-style-type: none"> • Essential 6: Inter-professional Collaboration for Improving Patient and Population Health Outcomes • <i>This DNP project utilized therapeutic communication and collaborative skills among the different anesthesia providers to develop and implement a change in health care.</i> |
| <ul style="list-style-type: none"> • Essential 7: Clinical Prevention and Population Health for Improving Nation's Health |

- *This DNP project disseminated clinical findings in regards to dexamethasone administration prior to peripheral nerve blocks to practicing anesthesia providers to improve overall outcomes and prevent post-operative pain*
- *The findings will have the potential to decrease post-operative pain and improve the health and satisfaction of surgical patients.*

- **Essential 8: Advanced Nursing Practice**

- *This DNP project designed, implemented, and evaluated whether or not a practice change occurred in response to the evidence based research that was presented to the practicing anesthesia providers.*
- *The research that was gathered for this project will further educate practicing anesthesia providers on the current data that is available.*

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