Addressing Barriers to Dexmedetomidine Use in Anesthesia Practice: Provider Education

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Addressing Barriers to Dexmedetomidine in Anesthesia Practice: Provider Education

DNP Scholarly Project Final Approval Form

DNP Scholarly Project Final Approvals

The DNP student Morgan J. Stunt **and the Scholarly Project** Addressing Barriers to Dexmedetomidine Use in Anesthesia Practice: Provider Education **meet all the requirements for the degree of Doctor of Nursing Practice at University of Saint Francis-Fort Wayne, IN.**

Date of Final Approval: June 24, 2022

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Copies to: Student File, Graduate office and attached to the Final Project Manuscript.

Abstract

Background: While initially approved for sedation in the intensive care units, dexmedetomidine use has vastly evolved and has been utilized as a perioperative anesthesia adjunct to improve adult and pediatric patient outcomes related to postoperative shivering, emergence delirium, and acute pain management. However, dexmedetomidine was an underutilized anesthetic adjunct by Great Lakes Anesthesia (GLA) providers at Saint Joseph Health System: Plymouth Medical Center (PMC). **Methodology:** The intention of the DNP scholarly project was to increase knowledge and use of dexmedetomidine through an educational intervention. The intervention consisted of an educational PowerPoint, which contained a detailed summary of the latest systematic reviews and meta-analyses on the various uses of dexmedetomidine in anesthetic practice. In addition, the DNP project team leader included a reference notecard with a concise summary of dexmedetomidine dosages and indications. To assess GLA provider knowledge, a pretest and posttest were administered before and after the educational intervention. To assess use of dexmedetomidine, a prospective chart audit was completed three months after the educational intervention. **Findings:** The DNP project team leader utilized percent of change to analyze GLA provider knowledge of dexmedetomidine and raw frequencies to assess use of dexmedetomidine. While there was only a 4% increase in posttest scores compared to pretest scores, 23 vials of dexmedetomidine were administered over the three-month period following project implementation. **Implications:** Due to the minimal increase in pre/posttest scores, an educational PowerPoint may not have been the most effective means to educate anesthesia providers. However, a condensed and accessible summary of the various uses of dexmedetomidine in anesthetic practice may have contributed to the increased use of dexmedetomidine at PMC.

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Chapter 1: Introduction

Dexmedetomidine is a highly selective α_2-adrenergic agonist with sedative, anxiolytic, analgesic, and sympatholytic effects without inhibition of the respiratory drive (Miller et al., 2015; Nagelhout & Elisha, 2018). Approved for clinical practice use in 1999, dexmedetomidine was initially used for short-term sedation for mechanically ventilated adult patients in intensive care units (Miller et al., 2015); however, its clinical benefits have vastly evolved, and dexmedetomidine is now utilized as an adjunct to anesthesia practice. According to the latest evidence, dexmedetomidine demonstrated superior benefits for both adult and pediatric patients throughout the perioperative period, particularly in addressing acute pain management, preventing postoperative delirium and perioperative shivering, and treating pediatric preoperative anxiety and postoperative emergence delirium. However, Great Lakes Anesthesia (GLA) providers at Saint Joseph Health System: Plymouth Medical Center (PMC) had not consistently adopted dexmedetomidine into practice, and education on the benefits and uses of dexmedetomidine was needed to improve provider knowledge and use of dexmedetomidine.

Problem

Problem Statement

Approximately 70% of healthcare providers utilize evidence-based practice, while the remaining 30% fail to incorporate evidence into practice (Thomas et al., 2014). Indeed, GLA providers at PMC had not implemented the latest evidence-based practice involving dexmedetomidine. Therefore, an educational intervention was needed to bridge this gap and increase anesthesia providers' knowledge and administration of dexmedetomidine.

PICOT Question

(P) For Great Lakes Anesthesia providers at Plymouth Medical Center, will (I) an educational intervention on the uses and benefits of dexmedetomidine (O) improve knowledge and use of dexmedetomidine in anesthetic practice?

Background of the Problem

Great Lakes Anesthesia (GLA) providers had been hesitant to use dexmedetomidine due to cost; however, dexmedetomidine has recently been developed into a generic formula (Levy, 2019); therefore, dexmedetomidine is now more affordable for facilities and patients. However, GLA providers were not familiar or comfortable with dexmedetomidine administration and required education on the various uses and benefits of dexmedetomidine to update their evidence-based practice. By increasing dexmedetomidine knowledge and use, GLA providers could improve adult and pediatric patient outcomes by reducing preoperative anxiety and preventing postoperative delirium (Duan et al., 2018; Janssen et al., 2019; Ming et al., 2020; Pan et al., 2019; Peng et al., 2019; Zeng et al., 2019). In addition, dexmedetomidine can be used to prevent perioperative shivering (Li et al., 2019; S. Liu et al., 2020; X. Liu et al., 2019; Miao et al., 2018; Shen et al., 2020; Sun et al., 2020; G. Wang et al., 2016; J. Wang et al., 2020; Y. Wang et al., 2019; Zhang et al., 2017) and prolong regional anesthetics for acute pain management (L. Pan et al., 2020; Vorobeichik et al., 2017).

Needs Assessment/Practice/Knowledge Gap

From December 2020 to February 2021, GLA providers utilized zero vials of dexmedetomidine in the perioperative area at PMC (Pharmacist A, personal communication, February 2, 2021). Dexmedetomidine was infrequently administered by anesthesia providers at PMC, which had been identified by the anesthesia providers as a lack of knowledge on the uses

and benefits of dexmedetomidine in anesthetic practice. Therefore, an educational intervention on the evidence-based uses of dexmedetomidine could improve anesthesia provider knowledge and administration of dexmedetomidine throughout the perioperative period.

DNP Project Overview

The DNP scholarly project was designed to be a quality improvement project. Overall, it was the intention of this project to provide the latest evidence on the various benefits and uses of dexmedetomidine in anesthetic practice to GLA providers and increase use of dexmedetomidine in the perioperative area at PMC. An educational PowerPoint on the uses and benefits of dexmedetomidine was created for GLA providers at PMC to improve knowledge and use of dexmedetomidine throughout the perioperative period. Three months immediately following project implementation, a prospective chart audit was completed by the PMC pharmacist and the DNP project team leader to determine dexmedetomidine use.

Scope of Project

The scope of the DNP scholarly project was to provide an educational intervention to increase anesthesia provider knowledge and use of dexmedetomidine in anesthetic practice. The DNP scholarly project was intended for GLA providers because GLA provides anesthesia at PMC. All anesthesia providers employed by GLA were included in the scholarly project, and GLA providers had two weeks to complete the educational intervention. However, the chart audit to determine dexmedetomidine use took place only at PMC, and all other GLA facilities were excluded from the chart audit. The educational intervention included both background information on dexmedetomidine, such as mechanism of action, metabolism, pharmacokinetics, and side effects, as well as the latest evidence-based practice regarding the various uses of

dexmedetomidine for both adult and pediatric patients in anesthetic practice. The educational PowerPoint included topics such as: acute pain management, perioperative shivering, and postoperative delirium. The evidence-based practice was derived from systematic reviews and meta-analyses published within the last five years. The goal of this DNP scholarly project was to provide a summary of the most recent evidence-based practice uses of dexmedetomidine in anesthetic practice with the intention of increasing use of dexmedetomidine to improve patient outcomes at PMC.

The project team leader did not anticipate any risk to GLA providers. Neither GLA providers nor PMC were compensated for participating in the scholarly project. No incentive was offered for the project team leader to present an educational intervention on the uses and benefits of dexmedetomidine in anesthetic practice. No identifiable information was collected during the educational intervention. No patient identifiable information was obtained during the prospective chart audit.

Stakeholders

The following were considered key stakeholders in the DNP scholarly project: project team leader Morgan Stuut, BSN, RN, DNP-NAP student; project advisor Dr. Megan Winegarden; project mentor Ms. Diane Madsen, CRNA; and academic advisor Dr. Keith Cotrell, CRNA, Assistant Director of Nurse Anesthesia Program. Other stakeholders included Dr. Creighton Kaiser, Pharmacist at PMC and the University of Saint Francis faculty.

Budget and Resources

Cost

The DNP scholarly project incurred minimal costs. In-kind costs were anticipated for the project team leader, project advisor, practice mentor, GLA providers, and PMC pharmacist. The in-kind costs were directly related to meetings as well as participation in the scholarly project. Direct costs included IBM SPSS Statistics Grad Pack 26.0 at $58.99 for a 12-month license. At the conclusion of the educational intervention, reference notecards containing dexmedetomidine dosing recommendations based on the literature were sent electronically to GLA providers with no anticipated direct cost.

Description of Resources

The scholarly project was administered by email. The project mentor sent the electronic informed consent, demographic questionnaire, pretest, educational intervention, and posttest through GLA work email accounts. The informed consent, demographic questionnaire, pretest, and posttest were proctored through Microsoft Forms. The educational intervention was sent in the form of a Microsoft PowerPoint presentation. Great Lakes Anesthesia providers were asked to allot 30 minutes to complete the informed consent, demographic questionnaire, pretest, educational intervention, and posttest. The DNP scholarly project required GLA providers to have internet access and a computer or smartphone to complete the electronic surveys and to view the PowerPoint presentation. SPSS Statistics was used to analyze data collected from the demographic questionnaire, pretest, and posttest.

The project team leader contacted the PMC pharmacist, who completed the prospective chart audit. The prospective chart audit required the pharmacist to use the database at PMC to gather data on the total number of vials of dexmedetomidine administered as well as route of dexmedetomidine administration. The prospective chart audit covered three months of dexmedetomidine administration immediately following project implementation from December 2021 to February 2022.

Process and Outcomes

General Timeline

While in clinical rotations during the fall of 2020, the project team leader noted a lack of use of dexmedetomidine by GLA providers at PMC. Upon further inquiry with GLA providers, the project team leader discovered GLA anesthesia providers were hesitant to use dexmedetomidine due to lack of knowledge of its uses and benefits. Therefore, the project team leader decided to implement a quality improvement project with an educational intervention on the uses and benefits of dexmedetomidine in anesthetic practice with the goal of improving knowledge and use of dexmedetomidine. In January 2021, the project team leader gained approval from Dr. Megan Winegarden (project advisor), garnered both interest and commitment from GLA provider Diane Madsen (project mentor), and completed a comprehensive literature review of the highest levels of evidence from January to April 2021. In addition, the project team leader completed Collaborative Institutional Training Initiative (CITI Program) in April 2021 (see Appendix A). The project team leader met frequently with both the project advisor and the project mentor to provide updates on findings and progress. In March 2021, the project team leader presented the project idea to University of Saint Francis (USF) faculty for initial approval, and in April 2021, the first draft of the informed consent was submitted. From May 2021 to June

of 2021, an organizational assessment, strengths, weaknesses, opportunities, and threats (SWOT) analysis, Force Field Analysis, project budget, and project timeline were completed to assist in DNP scholarly project implementation.

The project team leader developed aims, established tools for data collection, and determined statistical analysis for the DNP scholarly project. The project team leader continued to meet regularly with the project advisor. By September 2021, the project team leader finalized the informed consent and presented the DNP scholarly project proposal to USF faculty for approval to submit to USF's Institutional Review Board (IRB). The DNP scholarly project was approved by USF's IRB in October 2021 (Appendix B) and final USF faculty approval was granted on November 17, 2021 (Appendix C). The project team leader designed materials, such as a PowerPoint presentation and custom reference cards, to deliver the educational intervention to GLA providers. The project team leader implemented the educational intervention on December 1, 2021. The project team leader and PMC pharmacist completed the retrospective chart audit from December 1, 2021, to February 1, 2022. After implementation of the educational intervention, data was collected and analyzed during spring 2022. The project team leader disseminated results to USF faculty and GLA providers on June 24, 2022. See Appendix D for a chart version of the timeline.

Participant Inclusion/Exclusion Criteria

To participate in the educational intervention of the DNP scholarly project, the participant had to be contracted by GLA. The participant had to be either a certified registered nurse anesthetist (CRNA) or anesthesiologist. Exclusion criteria included non-anesthesia providers and anesthesia providers not employed by GLA.

No patient-identifying information was collected in the prospective chart audit at PMC. The PMC pharmacist reported the total number of vials of dexmedetomidine administered over the three-month period immediately following the educational intervention directly to the project team leader. In addition, the PMC pharmacist collected the number of vials administered for subarachnoid blocks, peripheral nerve blocks, and intravenous routes.

Setting and Target Population

The informed consent (Appendix E), demographic questionnaire (Appendix F), pre/posttest (Appendix G), and educational intervention (Appendix H) were administered electronically to all GLA providers to assess knowledge of dexmedetomidine uses and benefits in anesthetic practice. Electronic access was completed on a desktop or smartphone. Great Lakes Anesthesia employed approximately 30 anesthesia providers who might have rotated to PMC during or after implementation of the scholarly DNP project. While GLA providers were contracted at multiple hospitals in the states of Indiana and Michigan, the chart audit took place solely at PMC. Three months immediately following the educational intervention, the project team leader collaborated with the PMC pharmacist to determine use of dexmedetomidine in the preoperative area, main operating room, and post-anesthesia care unit. The data collected from this chart audit included both dexmedetomidine use and route of administration over the three months following the educational intervention. See Appendix I for the prospective chart audit data collection forms.

Expected Outcomes

An email containing specific instructions on order of completion of the informed consent, demographic questionnaire, pretest, educational intervention, and posttest was sent to GLA providers by the project mentor. The informed consent, demographic questionnaire, pretest, educational intervention, and posttest were expected to require 30 minutes to complete, and GLA providers were allotted two weeks to participate in the DNP scholarly project. The pretest and posttest were designed to assess GLA provider knowledge. A 15% increase in knowledge of dexmedetomidine mechanism of action and a 50% increase in knowledge of dexmedetomidine dosing for subarachnoid blocks was anticipated after viewing the educational PowerPoint on the various uses and benefits of dexmedetomidine in anesthetic practice. This increase in knowledge was measured by a percent of change from pretest and posttest score on specific questions that addressed dexmedetomidine mechanism of action and dexmedetomidine dosing for subarachnoid blocks.

The prospective chart audit was designed to assess dexmedetomidine use at PMC. The PMC pharmacist was asked to conduct a prospective chart audit spanning over a three-month period immediately following the educational intervention. The PMC pharmacist recorded the number of vials of dexmedetomidine administered throughout the perioperative period as well as the route of administration. Raw frequencies were collected and analyzed. The project team leader expected 10 vials of dexmedetomidine to be administered throughout the perioperative period and five of these administrations to be an adjunct in a subarachnoid block.

Risk Analysis

Risk Analysis

No anticipated immediate and or long-term risks to participants were anticipated. The DNP project team leader obtained informed consent from participants before implementing the educational intervention. By participating in this DNP scholarly project, participants might have gained an increase in knowledge of the uses and benefits of dexmedetomidine in anesthetic practice. No direct monetary compensation was given for participation. However, compensation may have been indirectly acquired in the form of improved patient outcomes. Deception was not necessary for completion of this scholarly project and was not intentionally used. No audio, video, or any other form of recording of the DNP scholarly project was used. Data collected was anonymous and stored in a password protected computer with access only by the project team leader.

Chapter 2: Synthesis of Supporting Evidence and Project Framework

Relevant Theory and Concepts

Theory: Constructivism

The intent of this project was to contribute to GLA providers' existing knowledge and to expand GLA providers' knowledge and use of dexmedetomidine. Thus, the adult learning theory of constructivism was used as a foundation to build upon anesthesia providers' existing knowledge and to expand this knowledge on the various evolving uses and benefits of dexmedetomidine in anesthetic practice.

Considered one of the of originators of constructivism, John Dewey (1916) emphasized experience and reflection as the foundations of educational growth. Dewey believed education to be both an active and passive process of growth and development with passive reflections of experiences and active assignments of value to these experiences. Additionally, Dewey (1916) argued the foundation of thinking to be recognition of something as incomplete or unfulfilled. To address this idea, one must try new things and assign meaning to these experiences; however, existing knowledge controls thinking (Dewey, 1916). Although, retrospective reflection of current knowledge is imperative for prospective growth of future knowledge. Ultimately, Dewey (1916) understood educational growth to be a continuity of experiences and knowledge.

Similarly, the essence of constructivism insinuates generation of new knowledge as a combination of previous knowledge and new knowledge, which is largely influenced by peers and environment (Mukhalalati & Taylor, 2019). Constructivism theory emphasizes that individuals are active pursuers of knowledge, and individuals generate new knowledge by relating this knowledge to existing knowledge, applying meaning to it, and monitoring its progression (Thomas et al., 2014). Constructivism is highly relevant to healthcare because

healthcare providers continuously develop their practice through the influence of their own personal experiences as well as their peers' practice. Therefore, an evidence-based educational intervention by an anesthesia peer on the uses of dexmedetomidine in anesthetic practice embraces the theory of constructivism and contributes to anesthesia providers existing knowledge.

While dexmedetomidine is a sedation medication commonly used in healthcare for sedation purposes, its use has expanded. Moreover, by embracing the learning theory of constructivism and providing educational material on additional uses of dexmedetomidine, such as an adjuvant for central and peripheral nerve blocks, for adult pain management, or intranasally for pediatric preoperative anxiety, anesthesia providers will be able to use prior knowledge of dexmedetomidine and expand knowledge, skills, and confidence of dexmedetomidine administration in their anesthetic practice. In addition, the knowledge of peer practice and positive outcomes may influence personal anesthesia practice.

Framework: Pathman's Pipeline

To translate evidence into practice, Pathman's Pipeline was used to guide the implementation of this project. Originally designed to improve physician adherence to pediatric vaccination practice guidelines, Pathman et al. (1996) created the Awareness-to-Adherence model to explain why clinician practice deviated from standardized practice guidelines and evidence-based practice. Pathman et al. (1996) suggested that practicing clinicians undergo the following cognitive and behavioral steps when adhering to evidence-based practice: awareness, agreement, adoption, and adherence. Additionally, Pathman et al. (1996) suggested failure could occur at each of these steps and would ultimately result in deviation from evidence-based

practice. Thus, each step and barrier should be assessed and addressed to improve clinician compliance of evidence-based practice (Pathman et al., 1996).

After discovering additional barriers to evidence translation, Glasziou and Haynes (2005) expanded upon Pathman's Awareness-to-Adherence model and created a seven-step model that included the cognitive and behavioral steps of clinicians when translating evidence into practice: awareness, acceptance, applicable, able, acted on, agreed to, and adhered to. Shortly after, Diner et al. (2007) created an image (Appendix J) that represented these seven steps to clinician adherence as a relatable water pipeline with leaks and faucets to exemplify the process of incorporating evidence into practice, where the pipeline represented the journey of the evidence into practice, the faucets symbolized the cognitive and behavioral steps, and the leaks signified barriers to translation of evidence into practice or pipeline. For Diner et al. (2007), the goal was to improve knowledge translation in the emergency department, for they believed it was imperative for clinicians to continuously evolve their practice based upon the latest evidence.

Lack of information on updated evidence-based practice was believed to be the barrier to awareness (Glaziou & Haynes, 2006). This barrier was addressed through an educational intervention that supplied the latest meta-analyses and systematic reviews on common uses of dexmedetomidine in anesthesia practice. However, providing information without addressing other barriers was not enough to translate evidence into practice (Pathman et al., 1996). Therefore, this project's intention was to address the cognitive steps of awareness, acceptance, applicable, able, and act on to translate evidence of dexmedetomidine into anesthesia provider practice. More specifically, this project focused on the faucets of awareness and acceptance of dexmedetomidine's evidence-based uses and benefits in anesthesia; the faucet of applicable by targeting GLA providers at PMC and their main patient population; the faucet of able with the

literature to support the administration of dexmedetomidine in the perioperative setting; the faucet of act on by providing anesthesia provider access to the presentation as well as a pocket card with dosing information to serve as a simple and accessible reminder. To thoroughly utilize the Pathman's Pipeline Model and transition evidence into practice, this project addressed anticipated leaks or barriers for each faucet or stage of translation of evidence-based knowledge, such as information overload, inadequate time, competing mandates and influences, skepticism, and contradictory experience (Diner et al., 2007).

All steps were applicable to this project except the final two steps: agree and adhere. These steps were patient-specific (Diner et al., 2007; Glasziou & Haynes, 2005) and, therefore, not applicable to this project.

Literature Review

In the search for literature on dexmedetomidine uses in anesthetic practice, the DNP project team leader used the following databases: Joanna Briggs Institute Systematic Review Library, EBSCO's Nursing Reference Center Evidence Based Summaries, TRIP, CINAHL Plus, Emcare, Google Scholar, and PubMed as well as the AANA website. The search terms were *dexmedetomidine, anesthesia, postoperative pain management, preoperative anxiety, delirium, shivering,* and *meta-analysis.* The DNP project team leader reviewed the reference section of the articles to retrieve further literature. To be considered for inclusion, studies had to meet the following criteria: (a) meta-analyses of randomized controlled trials (RCTs) comparing dexmedetomidine to placebo or another medication or (b) systematic literature reviews on the uses of dexmedetomidine.

While originally approved by the Food and Drug Administration (FDA) for sedation in the intensive care unit, anesthesia providers have expanded the uses of dexmedetomidine in the

anesthesia setting. This literature review sought common emerging uses and benefits of dexmedetomidine in anesthetic practice.

Dexmedetomidine is a highly selective α_2-adrenergic receptor agonist and possesses sedation, analgesia, anxiolysis, and sympatholytic properties (Miller et al., 2015; Nagelhout & Elisha, 2018). When dexmedetomidine binds to presynaptic α_2-adrenergic receptors, norepinephrine release is inhibited through a negative feedback mechanism, and, thus, the sympathetic response is diminished and results in sedation and analgesia (Nagelhout & Elisha, 2018). Pharmacokinetically, dexmedetomidine demonstrates rapid distribution with an onset time of approximately 20 minutes, half-life of 2 hours, high protein binding, complete biotransformation with no active metabolites, and a duration of action up to 30 minutes once the infusion is complete (Nagelhout & Elisha, 2018). Dexmedetomidine has central nervous system, cardiovascular, and respiratory effects that should be noted. Unlike other sedative agents, dexmedetomidine produces sedation that mimics natural sleep without subsequent respiratory depression or interference with electrophysiologic neuromonitoring (Nagelhout & Elisha, 2018). Furthermore, dexmedetomidine acts upon central α_2-adrenergic receptors to produce hypothermic and anti-shivering effects while also reducing the neuroendocrine release of norepinephrine in response to surgical stress (Nagelhout & Elisha, 2018). Additionally, Nagelhout and Elisha (2018) suggest the reduction in delirium, production of analgesia, as well as the anesthetic-sparing effects to be related to the central actions of dexmedetomidine. However, dexmedetomidine may cause transient hypertension when administered rapidly due to postsynaptic α_2-adrenergic receptor activation, though this will be followed by hypotension and bradycardia due to presynaptic α_2-adrenergic receptor activation (Nagelhout & Elisha, 2018).

Dexmedetomidine is a preservative-free medication and is typically administered as a 4 mcg/ml solution. Currently, dexmedetomidine is approved for both sedation in the intensive care unit and perioperative use in the operating room (Wiatrowski, 2021). Nagelhout and Elisha (2018) suggest a loading dose of 1-mcg/kg bolus dose over 10 minutes followed by a maintenance infusion of 0.2-0.7 mcg/kg/hr up to 24 hours.

Dexmedetomidine & Adult Pain Management

Subarachnoid Blocks.

As an alternative to general anesthesia, spinal anesthesia in the form of a subarachnoid block in the intrathecal space provides anesthesia for many lower abdominal and lower extremity procedures, such as cesarean sections and total knee replacements. For cesarean sections, subarachnoid blocks are the anesthetic of choice due to short onset, minimal hemodynamic alterations, fewer maternal and neonatal adverse effects, and it allows patients to stay awake during the procedure (X. Liu et al., 2019; Sun et al., 2020; Y. Wang et al., 2019). For other lower extremity and lower abdominal procedures, subarachnoid blocks dampen autonomic responses, inhibit painful sensation, and blunt sensory and motor responses while providing adequate anesthesia with minimal side effects and lower morbidity and mortality rates than general anesthesia (Pierce et al., 2016). However, subarachnoid blocks are limited by a short duration of action that requires early postoperative pain management interventions (Pierce et al., 2016; Sun et al., 2017) and could lead to an intraoperative transition from spinal anesthesia to general anesthesia if the block were to wear off during a prolonged procedure. Additionally, high doses of intrathecal local anesthetics have been known to produce maternal hypotension, neonatal acidosis, bradycardia, shivering, pruritis, nausea, and vomiting (X. Liu et al., 2019; Shen et al., 2020; Sun et al., 2020; Y. Wang et al., 2019). To mitigate the adverse effects associated with

subarachnoid blocks and prolong the duration of analgesia and anesthesia, local anesthetic adjuvants, such as dexmedetomidine, can be added to subarachnoid blocks.

Alpha$_2$-adrenergic agonists are thought to increase the duration of action of local anesthetics through prolongation of hyperpolarization as well as inhibition of the restoration of resting membrane potential (Nagelhout & Elisha, 2018). This action is thought to be predominately in sensory C-fibers as well as in motor A-delta fibers, though, dexmedetomidine is not currently approved by the FDA for subarachnoid administration (Nagelhout & Elisha, 2018; Paramasivan et al., 2020; Pierce et al., 2016). However, studies are currently being conducted to establish safety and efficacy of dexmedetomidine as an adjuvant to spinal anesthesia.

Three meta-analyses of RCTs assessed the efficacy of dexmedetomidine as an intrathecal adjuvant to local anesthetics for cesarean sections (X. Liu et al., 2019; Shen et al., 2020; Sun et al., 2020). For cesarean sections, intrathecal dexmedetomidine combined with local anesthetic significantly shortened the onset of motor blockade and significantly prolonged the duration of action of both sensory and motor blockade compared to intrathecal local anesthetics alone (Shen et al., 2020; Sun et al., 2020). More specifically, Sun et al. (2020) conducted a meta-analysis that examined six studies of women undergoing elective cesarean sections and found dexmedetomidine significantly prolonged the duration of sensory block by an average of 57 minutes. Although, X. Liu et al. (2019) found no significant prolongation of sensory blockade duration. While there was conflicting evidence as to dexmedetomidine's ability to significantly shorten the onset of sensory blockade, there was evidence of a trend of a shortened onset of sensory block (Sun et al., 2020). Regardless, there appeared to be little clinical significance to

the onset of both motor and sensory block onset as the difference was less than one minute (Sun et al., 2020).

For cesarean sections, dexmedetomidine appeared to be a safe adjuvant to local anesthetics in the subarachnoid space for mothers and neonates with no significant alterations in maternal or fetal outcomes (X. Liu et al., 2019; Shen et al., 2020; Sun et al., 2020). More specifically, compared to plain local anesthetics, Apgar scores were not significantly different at one and five minutes when dexmedetomidine was added as an adjuvant to subarachnoid blocks (Shen et al., 2020; Sun et al., 2020). Additionally, no significant incidences of maternal hypotension, bradycardia, nausea, vomiting, or pruritis were noted (X. Liu et al., 2019; Shen et al., 2020; Sun et al., 2020).

For other procedures that utilize spinal anesthesia, intrathecal dexmedetomidine added as an adjuvant to local anesthetics for spinal anesthesia was suggested to be both safe and efficacious (Li et al., 2019; S. Liu et al., 2020; Paramasivan et al., 2020; Sun et al., 2017; Y. Wang et al., 2019; Zhang et al., 2017). Like studies involving cesarean sections, dexmedetomidine significantly reduced the time to onset of both sensory and motor blockade when added to local anesthetics for subarachnoid blocks (Li et al., 2019; S. Liu et al., 2020; Zhang et al., 2017); however, this addition demonstrated little clinical relevance because the onset time difference compared to local anesthetics alone were less than one minute. Additionally, when added to local anesthetics for subarachnoid blocks, dexmedetomidine significantly prolonged duration of both sensory and motor blockade (Li et al., 2019; S. Liu et al., 2020; Zhang et al., 2017). In fact, Liu et al. (2020) found the duration of sensory and motor blockade to be prolonged by approximately 134 minutes and 114 minutes, respectively, when dexmedetomidine was added as an adjuvant to local anesthetics in a subarachnoid block

compared to local anesthetics alone. While sensory block duration is desired, motor block duration could result in delays in ambulation and patient falls (Li et al., 2019); therefore, when administering dexmedetomidine intrathecally, caution should be exerted and a determination of risk versus benefit should be considered.

In addition to improving the quality of subarachnoid blocks, dexmedetomidine prolonged the duration of analgesia without major adverse effects (Li et al., 2019; S. Liu et al., 2020; Zhang et al., 2017). Compared with placebo, dexmedetomidine prolonged the time to first postoperative analgesic requirement by approximately 217 minutes (S. Liu et al., 2020). However, caution should be exercised because dexmedetomidine may increase the risk for and incidence of transient bradycardia and hypotension, though without significant risk of nausea or vomiting (Li et al., 2019; S. Liu et al., 2020; Zhang et al., 2020). Contrarily, Paramasivan et al. (2020) and Y. Wang et al. (2019) suggested there was no significant incidence of bradycardia and hypotension when dexmedetomidine was administered as an adjuvant to local anesthetics in subarachnoid blocks. Though, the Paramasivan et al. (2020) study was relatively weak due to small sample sizes, inter-study heterogenicity, and potential publication bias, so these conclusions should be interpreted with caution. Nevertheless, administration of dexmedetomidine as an adjuvant to local anesthetics in subarachnoid blocks could result in clinically significant bradycardia and hypotension, and patients' heart rate and blood pressure should be monitored closely.

While the previous studies compared intrathecal dexmedetomidine to a placebo, Sun et al. (2017) conducted a meta-analysis of nine RCTs with 639 patients and compared two intrathecal adjuvants: dexmedetomidine and fentanyl. While fentanyl has demonstrated safety and efficacy as an adjuvant to local anesthetics in subarachnoid blocks, fentanyl has also been known to cause undesirable side effects, such as pruritis (Pierce et al., 2016), which can be a

source of major discomfort for patients; therefore, consideration of other intrathecal adjuvants is warranted. Sun et al. (2017) demonstrated the incidence of pruritis with fentanyl to be significantly greater than dexmedetomidine without a notable difference in the incidence of hypotension and bradycardia between the two medications. Consequently, dexmedetomidine could be considered the superior adjuvant for subarachnoid blocks compared to fentanyl due to elimination of the incidence of pruritis.

Peripheral Nerve Blocks.

Approximately 70% of patients undergoing surgery experience acute postoperative pain, which can result in patient dissatisfaction and an overall increase in healthcare costs due to possible readmission and prolonged recovery (L. Pan et al., 2020; Patacsil et al., 2016). To manage acute pain, the American Society of Anesthesiologist (ASA) practice guidelines strongly suggested the use of peripheral nerve blocks (PNBs) with perineural administration of local anesthetics when appropriate (Patacsil et al., 2016). However, PNBs have a limited duration of action and adjuvants, such as dexmedetomidine, have been studied to prolong the duration of blockade analgesic period of PNBs (L. Pan et al., 2020; Patacsil et al., 2016; Vorobeichik et al., 2017). While the mechanism of action is unclear, dexmedetomidine is thought to inhibit repolarization of nerve fibers and, therefore, neural conduction, which is thought to prolong duration of action of local anesthetics in PNBs (Vorobeichik et al., 2017). However, dexmedetomidine is not currently approved by the FDA for perineural administration (Patacsil et al., 2016; Vorobeichik et al., 2017), though anesthesia providers are utilizing this practice and studies are exploring the benefits of dexmedetomidine in peripheral nerve blocks.

Two meta-analyses examined dexmedetomidine as an adjuvant in upper extremity and lower extremity PNBs, and both studies suggested dexmedetomidine prolonged the duration of

sensory block, reduced opioid consumption, and improved patient satisfaction (L. Pan et al., 2020; Vorobeichik et al., 2017). More specifically, in a meta-analysis of 32 RCTs with 2,007 patients, dexmedetomidine significantly prolonged the duration of sensory and motor blockade by 3.8 hours and 10.1 hours in brachial plexus PNBs, respectively, and prolonged analgesia up to 11.9 hours with a reduction in the average postoperative oral morphine consumption by 10.2 mg (Vorobeichik et al., 2017). However, dexmedetomidine was found to increase the likelihood of bradycardia, hypotension, and sedation, though these adverse effects may be clinically insignificant because of the transient effect without required intervention (Vorobeichik et al., 2017). Similarly, Patacisil et al. (2016) found a dexmedetomidine dose of 150 mcg for interscalene brachial plexus blocks to prolong the duration of analgesia up to 240 minutes, though perineural dexmedetomidine administration increased the incidence of hypotension and bradycardia.

Dexmedetomidine & Adult Perioperative Shivering

The incidence of perioperative shivering ranges from 40%-60% and can lead to patient discomfort and incisional pain (Miao et al., 2018; G. Wang et al., 2016). In addition, shivering increases oxygen consumption up to 500%, which can lead to hypoxia, acidosis, and myocardial ischemia (Nagelhout & Elisha, 2018). Historically, perioperative shivering has been treated with opioid agonists, such as meperidine and tramadol, though these agents have been associated with negative side effects, such as postoperative nausea and vomiting and respiratory depression (Miao et al., 2018). Therefore, alternative agents, such as α_2-adrenergic agonists, have been explored, and studies have suggested dexmedetomidine to be effective in the prevention and treatment of perioperative shivering.

Dexmedetomidine is hypothesized to exert anti-shivering effect by binding to central α_{2B}-adrenergic receptors located in the brain and spinal cord to raise the shivering threshold and decrease the release of norepinephrine in response to surgical stress (Miao et al., 2018; Miller et al., 2015; Nagelhout & Elisha, 2018; J. Wang et al., 2020). In fact, eight meta-analyses of RCTs conducted in the past five years demonstrated a consistent reduction in perioperative shivering when dexmedetomidine was administered either intravenously or neuraxially via subarachnoid or epidural injections (Li et al., 2019; S. Liu et al., 2020; X. Liu et al., 2019; Miao et al., 2018; Paramasivan et al., 2020; G. Wang et al., 2016; J. Wang et al., 2020; Zhang et al., 2017).

In possibly the most rigorous examination of the administration of dexmedetomidine, Li et al. (2019) analyzed 22 studies with over 1300 patients who received either epidural or subarachnoid administration of dexmedetomidine and eliminated studies with confounding variables, such as central analgesics, opioids, and serotonin agonists, which could possibly produce anti-shivering effects. Li et al. (2019) suggested subarachnoid doses greater than 5 mcg of dexmedetomidine could reduce the incidence of perioperative shivering, though with a dose-dependent incidence of bradycardia. In fact, G. Wang et al. (2016) firmly concluded a significant reduction in heart rate within 1 hour in PACU after dexmedetomidine administration. Indeed, all the included meta-analyses demonstrated a statistically significant increase in the incidence of bradycardia; however, none of the studies demonstrated a clinically significant effect of bradycardia in which intervention was required (Li et al., 2019; Miao et al., 2018; G. Wang et al., 2016; J. Wang et al., 2020; Zhang et al., 2017).

Even though hypotension has been associated with dexmedetomidine administration, studies have demonstrated conflicting evidence. However, one meta-analysis analyzed 8 studies including 467 patients and firmly concluded a significant occurrence of concurrent hypotension

within 1 hour in PACU after dexmedetomidine administration (G. Wang et al., 2016). Therefore, administration of dexmedetomidine could result in hypotension and should be avoided in hemodynamically unstable patients.

Apart from tramadol, dexmedetomidine failed to demonstrate superior benefits compared to other anti-shivering agents (J. Wang et al., 2020; Zhang et al., 2017); however, the administration of dexmedetomidine could eliminate the need to administer other anti-shivering agents with established untoward side effects, such as nausea, vomiting, and respiratory depression. In fact, one study examined 13 RCTs with 864 patients that demonstrated a significant reduction in postoperative nausea and vomiting when dexmedetomidine was administered compared to tramadol (J. Wang et al., 2020). However, it is important to note that other studies have found conflicting evidence on the significance of dexmedetomidine's impact on postoperative nausea and vomiting, though these studies did not compare dexmedetomidine to other anti-shivering agents.

Dexmedetomidine & Adult Postoperative Delirium

Delirium is an acute alteration in arousal, cognition, attention, orientation, and perception unattributable to pre-existing conditions (Nagelhout & Elisha, 2018; Pavone et al., 2018). With an incidence ranging from 10% in the general surgical population up to 62% in high-risk populations, delirium can be detrimental with its associated increase in mortality, morbidity, length of hospital stays, and healthcare costs (Nagelhout & Elisha, 2018; Pavone et al., 2018). Age is directly proportional to risk of delirium, and nearly a quarter of the United States' population will exceed the age of 65 by 2060 (Pavone et al., 2018); therefore, anesthesia providers must utilize evidence-based practice to prevent and treat postoperative delirium.

Although the exact mechanism of action is unknown, dexmedetomidine can reduce the incidence of postoperative delirium in adult surgical patients (Duan et al., 2018; Janssen et al., 2019; Ming et al., 2020; H. Pan et al., 2019; Peng et al., 2019; Zeng et al., 2019). More specifically, a meta-analysis of 18 RCTS with 3,309 patients undergoing both cardiac and non-cardiac surgery firmly concluded dexmedetomidine reduced the incidence of postoperative delirium (Duan et al., 2018). Perhaps a study with greater strength, a meta-analysis of 11 RCTs involving 2,890 elderly patients undergoing non-cardiac surgery was able to demonstrate a significant reduction in postoperative delirium with dexmedetomidine administration (H. Pan et al., 2019). Additionally, Ming et al. (2020) suggested dexmedetomidine administration overall provided a relative risk reduction for postoperative delirium of 47%, while infusion rates less than 0.2 mcg/kg/hr demonstrated a 62% relative risk reduction for postoperative delirium. However, optimal timing of dexmedetomidine administration was not determined and further studies are needed.

Diener et al. (2017) conducted a study that was consistently reviewed in the meta-analyses, which concluded dexmedetomidine was unable to significantly reduce the incidence of postoperative delirium; however, the study demonstrated substantial risks of bias. Diener et al. (2017) utilized an overall lower dose of dexmedetomidine with a shorter duration of infusion and included patients with higher ASA classes with planned postoperative admission to the intensive care unit, which suggested a pre-existing condition attributable to altered mental status (Duan et al., 2018).

However, the administration of dexmedetomidine to prevent postoperative delirium was not without risk, and it has been suggested that dexmedetomidine increased the risk for hypotension and bradycardia, though, the results of each study differed and were considered

inconclusive. Due to conflicting evidence, Duan et al. (2018) was unable to demonstrate a relationship between dexmedetomidine administration and subsequent bradycardia and hypotension. Nevertheless, H. Pan et al. (2019) suggested dexmedetomidine administration to be associated with an increased risk of bradycardia and hypotension, though the included studies lacked standardized definitions of bradycardia and hypotension, so there was a risk of bias. On the other hand, Peng et al. (2019) and Zeng et al. (2019) suggested dexmedetomidine did not induce hypotension, but rather induced bradycardia in both cardiac and noncardiac surgery. Overall, perioperative administration of dexmedetomidine to prevent and treat postoperative delirium should be used with caution in patients where bradycardia or hypotension are clinically significant.

Dexmedetomidine & Pediatric Considerations

Pediatric patients are prone to preoperative anxiety, which can influence perioperative behaviors and pediatric outcomes (FitzSimons et al., 2017). In fact, up to 65% of pediatric patients experience preoperative anxiety, and anxiety is a major risk factor for postoperative emergence delirium (FitzSimons et al., 2017). In the pediatric population, postoperative emergence delirium is known to be a dangerous phenomenon and presents as an acute disturbance in cognition that can lead to unintentional and involuntary compromise in patient safety, resulting in patient falls, inadvertent removal of surgical drains, wound dehiscence, and blunt trauma, which can prolong hospital stays and increase healthcare costs (FitzSimons et al., 2017; Manning et al., 2020). Nearly 20% of pediatric patients experience postoperative emergence delirium, while other major factors for emergence delirium include young children, volatile anesthetics, and pain (FitzSimons et al., 2017; Manning et al., 2020). Even though oral benzodiazepines, such as midazolam, are the current standard of care to treat preoperative

anxiety, the literature suggests a link between midazolam and emergence delirium due to its agonism of gamma-aminobutyric acid (GABA) receptors, disruption of sleep cycles, and production of anterograde amnesia (FitzSimons et al., 2017); therefore, studies have been conducted to analyze alternative medications, such as dexmedetomidine, to both treat preoperative anxiety and prevent postoperative emergence delirium.

While not currently approved by the FDA as first line treatment, dexmedetomidine has been studied as an alternative to midazolam for the treatment of preoperative anxiety and prevention of postoperative delirium in the pediatric population (FitzSimons et al., 2017). Unlike midazolam, dexmedetomidine mimics natural sleep without interaction with GABA receptors and reduces the minimum alveolar concentration of inhalational anesthetics (FitzSimons et al., 2017; Manning et al., 2020). Additionally, dexmedetomidine possesses analgesic properties, which is another method in which the drug is hypothesized to prevent emergence delirium since pain is considered a risk factor for emergence delirium (FitzSimons et al., 2017). To treat preoperative anxiety and prevent emergence delirium in the pediatric population, studies have been conducted to analyze the effectiveness and safety of both preoperative intranasal and intraoperative intravenous dexmedetomidine.

Juan et al. (2017) conducted a meta-analysis of 13 RCTs and 1,168 pediatric patients and found when administered preoperatively, intranasal dexmedetomidine did not demonstrate a reduction in emergence delirium compared to other agents. Though Juan et al. (2017) demonstrated high heterogenicity so definite conclusions could not be made. This heterogenicity could be attributed to different dexmedetomidine doses, timing of doses, comparison group medications, and delirium assessment tools. However, both a meta-analysis of RCTs and a review of literature suggested dexmedetomidine significantly reduced the incidence of pediatric

postoperative delirium (Lang et al., 2020; Manning et al., 2020). More specifically, Lang et al. (2020) conducted a meta-analysis and included 14 studies and 969 pediatric patients that assessed the incidence of emergence delirium. Lang et al. (2020) indicated, compared to midazolam, dexmedetomidine significantly reduced the incidence of emergence delirium in pediatric patients. However, it is important to note that Lang et al. (2020) specified neither route nor dose of dexmedetomidine administration. Although, Manning et al. (2020) conducted a review of literature and proposed an intravenous dose up to 2 mcg/kg of dexmedetomidine administered immediately after induction consistently reduced the occurrence of emergence delirium. Important to note, regardless of route, the administration of dexmedetomidine was associated with a reduction in both heart rate and blood pressure (Jun et al., 2017; Lang et al., 2020; Manning et al., 2020). However, these studies questioned the clinical significance of hypotension and bradycardia since interventions were not necessary.

Overall, the administration of dexmedetomidine in the pediatric population to treat preoperative anxiety and prevent postoperative emergence delirium is a relatively new practice, and, subsequently, there is limited literature to definitively support a change in practice. For example, a systematic review by FitzSimons et al. (2017) was unable to find studies on the safety and efficacy of intranasal dexmedetomidine, though this systematic review had strict inclusion criteria, which only included studies with children aged three to seven years in addition to studies that utilized the same standardized scale. Even though this strict inclusion criteria may have limited the systematic review's results, it is important to note the lack of primary evidence with large study populations. However, the uses of dexmedetomidine may alter the future of pediatric anesthesia.

Summary

Overall, dexmedetomidine demonstrated statistically and clinically significant benefits for anesthetic practice and should be considered a valuable tool in the compendium of anesthesia medications. When added to local anesthetics for subarachnoid blocks, dexmedetomidine safely improved the quality of block by prolonging the duration, reducing opioid consumption, and preventing shivering (Li et al., 2019; S. Liu et al., 2020; Zhang et al., 2017). One major benefit could be the substitution of fentanyl in subarachnoid blocks with dexmedetomidine because dexmedetomidine demonstrated a significant reduction in the incidence of pruritis associated with intrathecal opioids (Sun et al., 2017). However, caution should be exercised because administration of dexmedetomidine in the subarachnoid space was associated with transient hypotension and bradycardia and prolongation of motor blockade (Li et al., 2019; S. Liu et al., 2020; Zhang et al., 2020). As an adjuvant to PNBs, dexmedetomidine could improve the quality of upper and lower extremity blocks, reduce opioid consumption, and improve patient satisfaction (L. Pan et al., 2020; Vorobeichik et al., 2017). Though clinically insignificant, dexmedetomidine in PNBs could result in transient bradycardia, hypotension, and sedation, and patients' heart rate and blood pressure should be more closely monitored (Patacisil et al., 2016; Vorobeichik et al., 2017).

Whether administered via intravenous or neuraxial route, dexmedetomidine demonstrated a significant reduction in the incidence of perioperative shivering (Li et al., 2019; S. Liu et al., 2020; X. Liu et al., 2019; Miao et al., 2018; Shen et al., 2020; Sun et al., 2020; G. Wang et al., 2016; J. Wang et al., 2020; Y. Wang et al., 2019; Zhang et al., 2017). Additionally, intravenous administration of dexmedetomidine reduced the incidence of postoperative delirium in the adult surgical population (Duan et al., 2018; Janssen et al., 2019; Ming et al., 2020; Pan et al., 2019;

Peng et al., 2019; Zeng et al., 2019). For pediatric patients, preoperative intranasal dexmedetomidine is currently being studied as a potential substitute for preoperative oral midazolam for the treatment of preoperative anxiety and prevention of postoperative emergence delirium, though superior benefits have yet to be established and more studies need to be conducted before a change in practice is recommended (FitzSimons et al., 2017; Juan et al., 2017). However, intravenous administration of dexmedetomidine immediately following induction could reduce the incidence of pediatric emergence delirium with clinically insignificant bradycardia and hypotension (Lang et al., 2020; Manning et al., 2020).

Discussion

Subarachnoid Block Recommendations

To safely prolong duration of both sensory and motor blockade of spinal anesthesia, the literature suggested to administer 5 mcg of dexmedetomidine in addition to the local anesthetic dose in the subarachnoid space (S. Liu et al., 2020; Y. Wang et al., 2019). However, due to the prolongation of motor blockade, dexmedetomidine should be avoided as a neuraxial adjuvant if procedures are less than 60 minutes in duration (Li et al., 2019). Additionally, further studies need to be conducted to assess neurotoxicity and long-term complications associated with intrathecal dexmedetomidine administration (S. Liu et al., 2020).

Peripheral Nerve Block Recommendations

To maximize the analgesic benefit and minimize the incidence of bradycardia and hypotension, the literature suggested administering a dose of 50-60 mcg of dexmedetomidine to local anesthetics for brachial plexus PNBs (Vorobeichik et al., 2017). However, the literature suggested an evaluation of the risks and benefits of prolonged motor blockade as well consideration and adequate monitoring of the potential adverse effects, such as bradycardia and

hypotension, associated with dexmedetomidine (Vorobiechik et al., 2017). While the literature had a high level of evidence for brachial plexus PNBs, the level of evidence for lower extremity nerve blocks was relatively low; therefore, additional studies were indicated to provide safe dosing and evaluation of dexmedetomidine as perineural adjuvant for PNBs in lower extremities.

Adult Perioperative Shivering Recommendations

To prevent perioperative shivering, the literature suggested an intrathecal dose of 5 mcg of dexmedetomidine to be the most efficacious adjuvant dose (S. Liu et al., 2020; X. Liu et al., 2019; Miao et al., 2018; Zhang et al., 2017). Further studies need to be conducted on the dosing of both epidural and intravenous dexmedetomidine specifically for the prevention and treatment of perioperative shivering. Additionally, more studies are needed to assess the clinical significance of bradycardia and hypotension with dexmedetomidine administration as well as the potential neurotoxicity (Miao et al., 2018; Zhang et al., 2017).

Adult Postoperative Delirium Recommendations

To reduce the incidence of postoperative delirium, the literature suggested a loading bolus dose of 0.5-1.0 mcg/kg of dexmedetomidine 60 minutes prior to the end of surgery followed by an infusion from 0.2-0.7 mcg/kg/hr up to 24 hours postoperatively (Duan et al., 2018; Janssen et al., 2019; Pavone et al., 2018). However, additional studies are needed to determine both optimal dose and timing of administration to prevent postoperative delirium while minimizing risk of hypotension and bradycardia (Duan et al., 2018; Ming et al., 2020; Zeng et al., 2019).

Pediatric Recommendations

To prevent emergence delirium in the pediatric patient, the literature suggested an intravenous bolus dose of 0.5 mcg/kg administered immediately following induction (Manning et

al., 2020). If the patient is hemodynamically unstable, it would be prudent to avoid dexmedetomidine. The literature has called for future large, double blinded RCTs to evaluate safety, efficacy, and dosing of intranasal dexmedetomidine in the treatment of preoperative anxiety and prevention of postoperative emergence delirium (Fitzsimons et al., 2017; Jun et al., 2017).

Chapter 3: Project Design & Methodology

Methodology

Project Design

The DNP scholarly project was designed as a quality improvement project because the aim was to initiate change through an educational intervention and practice improvement to impact healthcare outcomes (Moran et al., 2017). The educational intervention consisted of a PowerPoint on the uses and benefits of dexmedetomidine in anesthetic practice, which were derived from the latest systematic reviews and meta-analyses. This educational intervention was delivered to Great Lakes Anesthesia (GLA) providers in December 2021. Practice improvement was evaluated by (1) the comparison of pretest scores before the educational intervention, (2) posttest scores after the educational intervention to assess knowledge, and (3) by a prospective chart audit at PMC three months following the intervention to assess dexmedetomidine administration.

Ethical Considerations

Ethical considerations were strictly enforced throughout the development of the DNP scholarly project. Human subject protection was at the forefront of the project team leader's consideration. To ensure maximal human subject protection, the DNP scholarly project was submitted to the University of Saint Francis (USF) Institutional Review Board on Sunday, September 26, 2021. Neither Saint Joseph Health System: Plymouth Medical Center (PMC) nor Great Lakes Anesthesia required institutional IRB submission. See Appendix K for PMC and GLA letters of approval to implement. In addition, Collaborative Institutional Training Initiate (CITI) Program was completed during the spring of 2020 and certificates are referenced in Appendix A.

Prior to participating in the DNP scholarly project's educational intervention, GLA providers were asked to sign an informed consent form. Informed consent was required for project participation. Participation was completely voluntary, and participants were allowed to withdraw from the project at any time. No personal identifiable information was collected, and all information collected was anonymous. To ensure anonymity, the project mentor emailed GLA providers electronic links to Microsoft Forms, which included the informed consent, demographic questionnaire, and pre/posttest. Neither the project team leader nor the project mentor knew who chose to participate in the project. Data collected was not traceable to participants, and only the project team leader had access to the data collected on Microsoft Forms. This data collected will be stored on a password-protected device. Regardless of participation, all GLA providers received the dexmedetomidine dosing reference card after project implementation (Appendix H). No compensation or incentive was provided for GLA to participate in the DNP scholarly project.

For the prospective chart audit, the PMC pharmacist collected data on dexmedetomidine use in the preoperative area, main operating room, and post-anesthesia care unit. Only the total number of dexmedetomidine vials and the route of administration of dexmedetomidine was collected. No personal identifiable patient information was collected. Data collected was stored on a password-protected device and only accessible to the project team leader.

Project Schedule

A general timeline of the DNP scholarly project can be found in Chapter 1 and Appendix D. The informed consent, demographic questionnaire, pre/posttest, and educational PowerPoint were completed in August 2021. An executive summary of the proposed DNP project was presented to USF stakeholders on September 9, 2021, and approval to implement the DNP

scholarly project was attained. The executive summary was submitted to USF IRB on September 26, 2021.

After IRB approval, the project team leader generated an email with specific instructions for completion of the DNP scholarly project, the Microsoft PowerPoint, and links to Microsoft Forms, which included the informed consent, demographic questionnaire, and pre/posttests. This email was sent to the project mentor on December 1, 2021. The email with the DNP scholarly project was distributed by the project mentor to all GLA providers that same day. GLA providers were allotted two weeks to participate in the DNP scholarly project. In February 2022, the project team leader collaborated with the PMC pharmacist to complete the prospective chart audit and collect data on use of dexmedetomidine at PMC throughout the perioperative period. Data analysis was conducted spring 2022 with dissemination to USF faculty, GLA providers, and PMC stakeholders in summer 2022.

Implementation Methods

The DNP scholarly project was approved by USF's IRB on October 26, 2021. The DNP scholarly project was implemented on December 1, 2021. The project team leader composed an email with hyperlinks to the demographic questionnaire (Appendix F), informed consent (Appendix E), pre/posttests (Appendix G), and educational PowerPoint intervention (Appendix H) with detailed instructions for completion. This email was sent to the project mentor, who then forwarded the email to all GLA providers. Great Lakes Anesthesia providers were given two weeks to participate in the DNP scholarly project. To participate in the project, GLA providers were asked to complete an informed consent, demographic questionnaire, and pretest through Microsoft Forms before viewing the educational PowerPoint. After viewing the educational PowerPoint, GLA providers were asked to complete the posttest through Microsoft Forms.

Following the allotted two-week period, the project team leader emailed a reference card (Appendix H) with dexmedetomidine dosages to the project mentor, who then forwarded the card to all GLA providers.

Educational Intervention to Assess Knowledge

For the educational intervention, the project team leader delivered an educational PowerPoint on the uses and benefits of dexmedetomidine to GLA providers. The purpose of the PowerPoint was to provide GLA providers a comprehensive summary of the latest evidence-based practices regarding the various uses of dexmedetomidine in anesthesia. The main content of the PowerPoint was derived from systematic reviews and meta-analyses within the previous five years and was supplemented with background information on dexmedetomidine from Prodigy Anesthesia and anesthesia textbooks.

The educational PowerPoint intervention (Appendix H) was created by the project team leader with the following objectives:

1. Identify the uses for dexmedetomidine in anesthetic practice
2. Recognize the mechanism of action of dexmedetomidine
3. List the side effects of dexmedetomidine
4. Determine the recommended subarachnoid dose of dexmedetomidine
5. Determine the recommended peripheral nerve block dose of dexmedetomidine to prolong the duration of analgesia
6. Calculate the recommended intravenous dose of dexmedetomidine to prevent emergence delirium in pediatric patients

The goal of the educational PowerPoint intervention was to increase GLA provider knowledge on the uses and benefits of dexmedetomidine in anesthetic practice. The pretest and posttest were created to assess GLA provider knowledge and achievement of educational PowerPoint objectives. Participants were asked to allot approximately 30 minutes of their time to complete all components of the DNP scholarly project. After one week into project implementation, the project team leader generated an email to remind GLA providers of the deadline to participate. This email was sent to the project mentor, who then forwarded the email to GLA providers. This was repeated on the last day for project participation.

Prospective Chart Audit to Assess Use

Three months following the educational intervention, the project team leader contacted the PMC pharmacist to conduct a prospective chart audit of dexmedetomidine use at PMC. The PMC pharmacist was provided a data collection form to assess dexmedetomidine use. The PMC pharmacist was asked to record the total number of dexmedetomidine vials administered during the three-month period immediately following the educational intervention. Additionally, the PMC pharmacist was asked to record the routes through which the dexmedetomidine vials were administered. Data collection forms for the prospective chart audit can be found in Appendix I.

Measures/Tools/Instruments

The following aims, outcomes, and instruments were created by the project team leader to assess GLA provider knowledge and use of dexmedetomidine in anesthetic practice.

1. Aim 1: Increase anesthesia provider knowledge on uses and benefits of dexmedetomidine in anesthetic practice.

1a. Outcome: Following project implementation, anesthesia providers will increase knowledge of dexmedetomidine mechanism of action by 15%. This will be measured by a percent of change comparing the total scores of pretest question #1 and posttest question #1.

2a. Outcome: Following project implementation, anesthesia providers will increase knowledge of dexmedetomidine dosage for subarachnoid blocks by 50%. This will be measured by a percent of change comparing the total scores of pretest question #6 and posttest question #6.

2. Aim 2: Increase the administration of dexmedetomidine as an adjunct to anesthetic practice.

2a. Outcome: Three months following project implementation, GLA providers will utilize 10 vials of dexmedetomidine throughout the perioperative period. This will be measured by conducting a prospective chart audit three months after the intervention to collect the raw frequencies of the total number of dexmedetomidine vials administered in the preoperative area, main operating room, and post-anesthesia care unit at PMC.

2b. Outcome: Three months following project implementation, GLA providers will administer dexmedetomidine as an anesthetic adjunct for subarachnoid blocks for five patients. This will be measured by raw frequencies of the total number of patients who received a subarachnoid block with dexmedetomidine as an anesthetic adjunct.

The DNP project aims were measured by instruments and tools generated by the project team leader. The project team leader created the demographic questionnaire, pre/posttest, and educational intervention. The pre/posttest received face validity from two anesthesia experts. The demographic questionnaire and pre/posttest are referenced in Appendix F and G, respectively.

As referenced in the informed consent, all information collected was both anonymous and confidential. To participate in the project, GLA providers completed the informed consent. The project mentor distributed the DNP scholarly project to GLA providers, and the project team leader collected data through Microsoft Forms, ensuring neither the project team leader nor the project mentor knew who participated in the DNP scholarly project. Each participant was assigned a unique identification number to ensure anonymity. Data collected had no personal identifiable information.

Evaluation Plan

Measures and Data Sources

For the educational intervention, the project team leader anticipated approximately 30 GLA providers to receive an invitation to participate in the DNP scholarly project. Participants were allotted two weeks to participate in the project. All data was collected through Microsoft Forms and was both anonymous and confidential.

For the prospective chart audit, the PMC pharmacist collected data on dexmedetomidine use through Cerner, the computer software program at PMC. The PMC pharmacist recorded overall dexmedetomidine use and route of dexmedetomidine administration in the preoperative

area, main operating room, and post-anesthesia care unit at PMC from December 1, 2021, through February 1, 2022.

Methods for Collection of Data

Demographic Questionnaire. The demographic questionnaire (Appendix F) was completed first. The demographic questionnaire collected information on participants' gender, age, occupation, experience, contract, location of practice, type of anesthesia, and dexmedetomidine use and exposure. Data was collected through Microsoft Forms and only accessible by the project team leader. This information was used to describe the target population, and no personal identifiable information was collected.

Pretests and Posttests. After the demographic questionnaire was completed, participants were asked to complete the pretest to assess GLA provider knowledge of dexmedetomidine prior to the educational intervention. After completing the educational intervention, participants were instructed to complete the posttest to assess GLA provider knowledge of dexmedetomidine after the educational intervention. The pretest and posttest were the exact same questions. These questions addressed dexmedetomidine mechanism of action, metabolism, dosing considerations, side effects, and case scenario questions that assessed dexmedetomidine dosing in subarachnoid blocks and peripheral nerve blocks, and for the pediatric population. Data collected was through Microsoft Forms and only accessible to the project team leader.

Chart Audit. To complete the prospective chart audit, the project team leader contacted PMC's pharmacist to gather the total number of vials of dexmedetomidine administered over the three-month period immediately following implementation of the educational intervention. Of the vials administered, the PMC pharmacist recorded the route of dexmedetomidine

administration. The PMC pharmacist collected raw frequencies of the number of vials of dexmedetomidine, and no identifying patient information was collected.

Data Analysis Plan

Demographic information was used to describe the population of the participants. Pre/posttest scores and specific questions within the pre/posttests was used to assess GLA provider knowledge, while the prospective chart audit was used to assess dexmedetomidine use. The project team leader analyzed data collected from the pre/posttests with percent of change to evaluate GLA knowledge of dexmedetomidine and analyzed data collected from the prospective chart audit with raw frequencies to evaluate dexmedetomidine use. The project team leader utilized SPSS Statistics to analyze data collected through Microsoft Forms.

Dissemination Plan

The project team leader disseminated an executive summary of the DNP scholarly project's results in a formal presentation to USF faculty and stakeholders on June 24, 2022. After dissemination to USF faculty, the DNP project manuscript was made electronically accessible in the USF DNP Project Repository. The executive summary and results of the DNP scholarly project were shared with GLA stakeholders and participants. The project team leader shared the executive summary and results with the project mentor, who was then asked to share this summary with GLA providers. The project team leader also emailed the executive summary and results to the PMC pharmacist. Data shared had no identifiable participant and patient information.

Implementation Process Analysis

The DNP project team leader implemented two interventions: an educational PowerPoint on the various uses and benefits of dexmedetomidine in anesthetic practice and a prospective chart audit at PMC. The educational intervention was implemented with the assistance of the DNP project mentor, and the prospective chart audit was implemented with the assistance of the PMC pharmacist. For the educational intervention, the DNP project mentor emailed participants the educational PowerPoint as well as frequent reminders to participate in the project. For the prospective chart audit, the PMC pharmacist ran a ticket and received quantitative feedback on the number of dexmedetomidine vials administered from December 1, 2021, to February 1, 2022, in addition to the route of dexmedetomidine administration. With the help of both the DNP project mentor and the PMC pharmacist, the DNP project team leader was able to implement the DNP project successfully. Even though the DNP project team leader relied on other people and risked delays in implementation and miscommunication, the implementation process was successful and seamless. The DNP project mentor and PMC pharmacist communicated in an open and efficient manner, demonstrating that effective teamwork was worth the risk.

Chapter 4: Results and Outcome Analysis

Data Collection Techniques

The DNP project team leader utilized two different methods for data collection for the educational intervention and the chart audit. Data collected for the educational intervention was through Microsoft Forms. The DNP project team leader created three separate Microsoft Forms for the demographic questionnaire, pretest, and posttest. Links to each form, educational PowerPoint, and directions for order of completion were emailed to the project mentor at GLA, who then forwarded this email to all GLA providers. GLA providers were given two weeks to participate in the DNP scholarly project. Overall, a total of four CRNAs completed the demographic questionnaire, pretest, and posttest, which was a response rate of approximately 13%. Of note, one participant completed the demographic questionnaire without completing the pretest or posttest. Consequently, the participant's demographic data was eliminated from data analysis. On average, the pretest and posttest took approximately two minutes to complete, whereas the demographic questionnaire took approximately 50 seconds to complete.

Data collected for the chart audit was through a generated report, which was authorized by the PMC pharmacist. The report was requested on February 1, 2022, and the report was received 10 days after the request. The PMC pharmacist forwarded this report to the DNP project team leader. Data collected from both the educational intervention and chart audit were entered into SPSS Statistics for data analysis.

Measures/Indicators

The DNP project team leader used SPSS Statistics to describe the participants who partook in the educational intervention and to analyze the results of the pre/posttests. Graphic representations were included for clarity and emphasis (Appendix O).

Demographic Data

The following data described the CRNAs at GLA who participated in the educational intervention of the DNP scholarly project. Data related to participant gender, age, occupation, experience, contract, practice location, types of anesthesia, as well as previous dexmedetomidine use and knowledge was obtained. Seventy five percent of participants were male (Figure 1.1). Participants were aged 31 or greater, and 50% of participants were between the ages of 51 and 60 (Figure 1.2). Three out of the four participants rotated to PMC (Figure 1.3). All participants were CRNAs with greater than 10 years of anesthesia experience, contracted as a W2 employee with GLA, and had used dexmedetomidine prior to the educational intervention. While all participants had prior knowledge and use of dexmedetomidine, none of the participants received education of dexmedetomidine in their undergraduate or graduate studies.

Pre/Posttest

The average pretest score was 75%, and the average posttest score was 78%. As demonstrated by Figure 1.3 (Appendix O), only one participant improved overall test score after viewing the educational PowerPoint. Overall, there was a 4% increase in posttest scores compared to pretest scores.

Chart Audit

From December 1, 2021, through February 1, 2022, GLA providers at PMC utilized 23 vials of dexmedetomidine with a concentration of 400 mcg/100 ml, and all 23 vials were administered via the intravenous route (Pharmacist A, personal communication, February 10, 2022).

Indicators

1. Aim 1: Increase anesthesia provider knowledge on uses and benefits of dexmedetomidine in anesthetic practice.

    1a. Outcome: Following project implementation, anesthesia providers increased knowledge of dexmedetomidine mechanism of action by 50%. This was measured by a percent of change comparing the total scores of pretest question #1 and posttest question #1. Overall, pretest question #1 had an average score of 50% and posttest question #1 had an average score of 75%.

    2a. Outcome: Following project implementation, anesthesia providers decreased knowledge of dexmedetomidine dosage for subarachnoid blocks by 33%. This was measured by a percent of change comparing the total scores of pretest question #6 and posttest question #6. Overall, pretest question #6 had an average score of 100% and posttest question #6 had an average score of 75%.

2. Aim 2: Increase the administration of dexmedetomidine as an adjunct to anesthetic practice.

    2a. Outcome: Three months following project implementation, GLA providers utilized 23 vials of dexmedetomidine throughout the perioperative period. This was measured by conducting a prospective chart audit to collect the raw frequencies of the total number of dexmedetomidine vials administered in the preoperative area, main operating room, and post-anesthesia care unit at PMC three months after implementation of the educational PowerPoint.

2b. Outcome: Three months following project implementation, GLA providers did not administer dexmedetomidine as an anesthetic adjunct for subarachnoid blocks for patients. This was measured by raw frequencies of the total number of patients who received a subarachnoid block with dexmedetomidine as an anesthetic adjunct.

Data Analysis Inferences

Overall, anesthesia providers increased knowledge on the uses and benefits of dexmedetomidine in anesthetic practice as demonstrated by a 4% increase in total posttest scores compared to total pretest scores. However, some participants scored worse on specific questions in the posttest compared to the pretest, which contradicted an assumed increase in knowledge. For example, anesthesia providers demonstrated a 33% reduction in posttest question #6, which pertained to subarachnoid dosing of dexmedetomidine. This contradictory reduction in score was related to one participant. Either the educational PowerPoint was not effective in communicating the correct subarachnoid dose, or the participant did not complete the educational PowerPoint. On the other hand, anesthesia providers showed a 50% improvement in knowledge of dexmedetomidine mechanism of action. Even though there was a total increase in anesthesia provider posttest scores compared to pretest scores, there was contradictory evidence of knowledge gained within specific questions comparing the pre/posttests. Therefore, the educational intervention may not have been the most effective means of delivering the knowledge on dexmedetomidine to anesthesia providers.

While there was contradictory evidence of knowledge gained, there was overwhelming evidence of an increase in dexmedetomidine use. Anesthesia providers went from not using dexmedetomidine at all to using 23 vials within a three-month period following the educational

intervention. Even though anesthesia providers did not utilize dexmedetomidine in the anticipated subarachnoid route, anesthesia providers used dexmedetomidine as an intravenous anesthetic adjunct. While dexmedetomidine knowledge may or may not have increased, dexmedetomidine use most certainly increased. Because the DNP project leader sent a virtual index card with a condensed summary of the educational intervention, the participants in the DNP project may not have viewed the educational PowerPoint but rather used the educational index card to improve use of dexmedetomidine. This finding questioned the effectiveness of an educational PowerPoint, and alternative interventions should be considered for future studies involving educational interventions for the adult learner.

Gaps

Great Lakes Anesthesia providers were allotted two weeks to participate in the educational intervention; however, upon further consideration, the DNP project team leader and DNP project mentor extended the deadline for participation by one week, so GLA providers had three weeks to participate in the educational intervention. Of the 30 potential GLA providers, 5 GLA providers filled out the demographic questionnaire. However, only 4 of the providers completed the pretest and posttest. The DNP project team leader utilized Microsoft Forms data to analyze the dates and times of demographic questionnaire completion and eliminated the demographic questionnaire that did not have a corresponding pretest or posttest.

Unanticipated Consequences

The DNP project team leader followed up with the DNP project mentor at PMC, and the DNP project mentor reported an increased dexmedetomidine use at GLA facilities other than PMC. The DNP project mentor reported dexmedetomidine use in subarachnoid blocks for

orthopedic and obstetrical patients and personal observations of patient outcomes related to dexmedetomidine use (personal communication, December 31, 2021).

While at an interview for an anesthesia position in Ohio, the DNP project team leader discussed the DNP project with anesthesia providers at the site, and the anesthesia providers requested a summary of the DNP project to assist with dexmedetomidine administration at that facility. Unexpectedly, the anesthesia providers requested dexmedetomidine from pharmacy that day and administered dexmedetomidine to the patient with the guidance of this DNP project's findings. The DNP project team leader reflected on this experience and concluded that an in-person implementation may have been more immediately effective than a virtual platform.

Expenditures

The DNP scholarly project incurred minimal costs to the DNP project team leader and no direct costs to neither GLA providers nor the PMC pharmacist. Direct costs for the DNP project team leader included IBM SPSS Statistics Grad Pack 26.0 at $58.99 for a 12-month license.

Chapter 5: Leadership and Management

Understanding the culture of an organization is essential for successful implementation of a quality improvement project, translation of evidence into practice, and, subsequently, a change in practice (White et al., 2016). In a healthcare system, culture can be specific to the organization, a particular hospital unit or team, or just a single healthcare provider, and each cultural component must be assessed and analyzed to facilitate successful implementation of change (White et al., 2016). After conducting an assessment and an analysis of an organization's culture, a change theory should be utilized to enable implementation of the quality improvement project (Moran et al., 2017), which assists in determining both the timing and location of implementation. Even with a thorough understanding of an organization's culture and the assistance of a change theory, resistance to change can occur (Moran et al., 2017); however, strong leadership, interprofessional collaboration, and conflict management strategies can help mitigate resistance to change and augment translation of evidence into practice.

Organizational Culture

Burke and Litwin Model

The culture of an organization is a set of shared values and beliefs among a group, and these shared values and beliefs are derived from an organization's mission, vision, and core values (White et al., 2016). However, a full assessment of an organization from the leaders and employees to the external environment and internal influential factors needs to be examined to understand the culture of an organization. To understand Great Lakes Anesthesia's (GLA) culture and assess readiness for change, an organizational assessment guided by the Burke and Litwin Model was completed.

The Burke and Litwin Model was created to explain organizational functioning and to assess implications for organizational change (Burke & Litwin, 1992). Depicted in Appendix L, the Burke and Litwin Model is a causal model with an open-systems principle, meaning each component of the model has influence over another component and vice versa, which is represented by the bidirectional arrows (Burke & Litwin, 1992). For example, Burke and Litwin (1992) believed the performance of the system impacted the external environment, such as positive patient outcomes of a hospital improving the health of the community, while the external environment influenced the performance of the organization, such as state regulations limiting CRNA scope of practice and, consequently, a reduction of surgical services provided by the hospital.

The Burke and Litwin Model contains 12 boxes to represent organizational variables most influential on organizational performance and change. These variables are considered either transformational or transactional, or, in other words, external environmental forces or internal forces, respectively (Burke & Litwin, 1992). Transformational factors are considered the external environment, mission and strategy, leadership, organizational culture, and individual and organizational performance, whereas, transactional factors are considered the structure, management practices, systems, work unit climate, task and individual skills, motivation, individual needs and values, and individual and organizational performance (Burke & Litwin, 1992). Both transformational and transactional factors influence each other and, ultimately, both impact individual and organizational performance.

Each variable of the Burke and Litwin Model represents a unique contribution to organizational performance and change. According to Burke and Litwin (1992), the external environment can be any outside influence on the organization, such as state and federal

regulations, while the mission and strategy are established statements of management's beliefs and employees' perceptions of the purpose of an organization. Leadership provides direction and behavioral role models for employees of the organization, while culture is a set of values, rules, and principles that guide meaning and behavior within an organization (Burke & Litwin, 1992). While structure establishes roles, responsibility, authority, communication and relationships within the organization, management practices are specific to distribution of resources at the organization, and both structure and management practices are implemented to fulfill the organization's mission and strategy (Burke & Litwin 1992). Furthermore, systems consist of standardized policies and procedures, performance appraisal, and resource allocation, whereas climate is derived from employee's perceptions, thoughts, and feelings about the work environment (Burke & Litwin, 1992). Task requirements and individual skills are organizational expectations for its employees, whereas individual needs and values are derived from individual employees' perceptions of worth (Burke & Litwin, 1992). Finally, Burke and Litwin (1992) described motivation as the tendency of employees within an organization to progress toward a goal and achieve personal satisfaction, while individual and organizational performance to be an outcome and indicator of success, such as profit and customer satisfaction.

Organizational Assessment: Burke and Litwin Model

An organizational assessment of Great Lakes Anesthesia (GLA), the anesthesia group contracted at Saint Joseph Health Systems: Plymouth Medical Center (PMC), was conducted using the Burke and Litwin Model (Appendix L), which assessed organizational performance as well as readiness for change and implementation of the DNP project. Evidence for organizational assessment was obtained both by personal observation from the DNP project leader and by interview with a certified registered nurse anesthetist (CRNA) employed by GLA.

External Environment

During implementation of this project, the State of Indiana required CRNAs to practice under the Physician Supervision Model, which required a physician to be available for assistance if needed (AANA, n.d.). For GLA, a physician anesthesiologist was only required to audit 10% of the total anesthetic cases completed by CRNAs each year but did not supervise the CRNA's cases (personal communication, May 17, 2021). Additionally, with the exception of dentists and podiatrists, surgeons, not physician anesthesiologists, signed off on the anesthetic plan administered by the CRNA. While many believed physician supervision limited scope of CRNA practice, decreased access to anesthesia care for patients, and reduced cost-effectiveness (AANA, n.d.), GLA worked with emergency department physicians at PMC and utilized these physicians at the facility to act as physician supervisors of anesthesia cases (personal communication, May 17, 2021). This agreement between GLA and Plymouth Medical Center facilitated CRNA independence, which increased access to care for the community and cost-effectiveness for the facility. This independent practice for CRNAs provided an opportunity to initiate change within an organization because each anesthesia provider dictated their own anesthetic plan.

Mission and Strategy

The essence of GLA's mission was to provide quality patient care (Great Lakes Anesthesia, n.d.), which resonated with GLA providers. Each anesthesia provider took pride in their art of anesthesia, which was formed around patients' well-being and wishes. Furthermore, there was not a "one size fits all" strategy for care. Each patient was assessed by the anesthesia provider, and an individualized plan of care was developed based upon the patient's comorbidities and personal wishes, surgical procedure, and surgeon's preference. Indeed, GLA's providers believed the healing process to be superior when patients were treated on an individual

basis (personal communication, May 17, 2021). For example, CRNAs at GLA were not reimbursed for regional blocks performed under general anesthesia; however, one patient was particularly anxious about remaining awake while the block was performed. Rather than collect the reimbursement and perform the regional block while the patient was awake, the CRNA performed the regional block under general anesthesia to eliminate anxiety while still providing pain relief for the patient. When this was communicated to the owner of GLA, the owner commended the CRNA because it was the best plan for the patient (personal communication, May 17, 2021). Great Lakes Anesthesia's employees and leadership all resonated with the mission and provided quality anesthesia care. Because GLA providers did what was best for the patient, these providers were willing to accept change if it was the best plan for the patient.

Leadership

According to its employees, GLA operated under a shared leadership model because joint decisions were made between the leaders of the organization and the employees, and the leaders of GLA were equal to employees (personal communication, May 17, 2021). For example, the founder and owner of GLA worked as a CRNA at PMC, involved his employees in clinical and corporate decisions, and encouraged collaborative efforts between himself as the leader and his employees. This atypical leadership empowered GLA providers to practice confidently and competently while enabling loyalty to the organization. Through this shared leadership, there was an opportunity to collaborate with GLA's leader and promote organizational growth and change.

Culture

Both the mission and leadership style of GLA contributed largely to the culture of the organization. With the goal to deliver individualized, quality care to patients and through the

encouragement and support from leadership, anesthesia providers at GLA worked in a culture of excellence. At GLA, providers were invested in the outcomes of their patients and the quality of their care (personal communication, May 17, 2021). For example, an ultrasound machine was provided for anesthesia providers to perform regional anesthesia for patients; however, not every anesthesia provider was skilled in ultrasound-guided regional anesthesia (personal communication, May 17, 2021). Because it was the right thing to do for patients, the anesthesia providers of the group encouraged one another to become proficient in regional anesthesia and taught one another regional blocks (personal communication, May 17, 2021). This action exemplified the culture of excellence at GLA, where each provider was encouraged to practice at the peak of their abilities. Through this culture of excellence and encouragement of anesthesia coworkers, a change in one provider's practice could have influenced a change in another provider's practice.

Structure

Great Lakes Anesthesia facilitated independence of the CRNAs by allowing these providers the opportunity to be solely responsible for each patient's anesthetic care. With surgeons and emergency department physicians supervising the anesthesia care, CRNAs at GLA were the experts of anesthesia and were granted decision-making authority. The CRNAs were expected to independently conduct preoperative interviews, provide intraoperative anesthesia care, and manage postoperative pain, in both the post-anesthesia care unit and the inpatient units, which allowed seamless patient care and facilitated high quality patient outcomes. Because CRNAs were granted the opportunity to create their own anesthetic plan, there were more providers available to influence a change in practice, rather than one or two physician anesthesiologists who decided the anesthetic plans for all CRNAs.

Management Practices

To facilitate the mission of GLA and provide quality patient care, GLA's management team provided an ultrasound machine to improve quality of peripheral nerve blocks, reduce postoperative pain, and improve patient satisfaction (personal communication, May 17, 2021). Because the driving force of GLA's management team was patient satisfaction and quality patient care, GLA's management supported providers' requests for supplies and materials to manage patient care. The anesthesia providers requested a curvilinear probe to provide superior views and safer delivery of deeper regional blocks for all patient populations, and the management team at GLA worked to obtain this important tool for anesthesia practice (personal communication, May 17, 2021). With the continuous support and resources from management to provide quality patient care, GLA demonstrated strong potential to implement change.

Systems

With the organization's mission at the forefront of the system's processes, GLA required annual peer reviews in addition to individual anesthesia performance appraisals (personal communication, May 17, 2021). More specifically, GLA required three anesthesia providers to peer review each anesthesia provider's practice and professionalism on a yearly basis to ensure high quality, professional anesthetic care was consistently delivered. Additionally, PMC hired a third-party to distribute patient satisfaction surveys for each patient to assess anesthesia provider performance. These patient satisfaction surveys included questions involving comprehension of the anesthetic plan, explanation of anesthetic medications, and professionalism of the anesthesia provider (personal communication, May 17, 2021). Each of these system's components were implemented with the intention to ensure quality, patient-centered anesthesia care. With the

standardized feedback and frequent checks on GLA provider performance, the providers at GLA were willing to change anesthetic practices based on the results of these system processes.

Climate

For anesthesia providers at PMC, the climate manifested respect (personal communication, May 17, 2021). For example, CRNAs had professional and personal relationships with the perioperative staff at PMC. Nurses, technicians, and surgeons sought advice from the CRNAs regarding personal care and requested their anesthesia services for family members. Additionally, the perioperative staff looked to the CRNA during a crisis to take control of the situation. Overall, CRNAs felt empowered with the respect from colleagues, which facilitated confidence, peak performance, teamwork, and a mutually beneficial work environment (personal communication, May 17, 2021). To remain respected and meet expectations, GLA providers were open to new ideas and willing to change to improve and expand upon their practice.

Task Requirements and Individual Skills/Abilities

While there were no specific skills, abilities, or task requirements for anesthesia providers, GLA embodied a culture of excellence, so providers were expected to exhibit professionalism and independence; therefore, providers pursued the highest level of education and maximized their personal skills and abilities to exemplify GLA's mission (personal communication, May 17, 2021). For example, while regional anesthesia skills were not required for employment with GLA, regional anesthesia was a contribution to patient satisfaction and surgeon preference, so providers became proficient in ultrasound-guided regional blocks. Even though GLA did not organize official educational opportunities, GLA provided reimbursement

for educational opportunities sought out by its providers (personal communication, May 17, 2021). Therefore, opportunities for change and growth in practice were encouraged by GLA.

Individual Needs and Values

To ensure the organization's mission was embodied and the organization's culture and climate facilitated a positive experience for both patients and staff, the individual needs and values of providers at GLA were revered. For example, GLA used strategic staffing to facilitate employee satisfaction and reduce employee turnover rate (personal communication, May 17, 2021). GLA considered commute, call preferences, and personal wishes of each employee when determining staffing at each facility (personal communication, May 17, 2021). Additionally, CRNAs at GLA valued independence and respect, which were augmented by the structure, management practices, and leadership at GLA (personal communication, May 17, 2021). Great Lakes Anesthesia's shared leadership model allowed the CRNA's voice to be heard, while GLA's structure promoted independent decision-making practice, and GLA's culture and climate fostered respect for the CRNA.

Motivation

For GLA, the largest motivators were surgeon and patient satisfaction. Great Lakes Anesthesia had two customers: the patient and the surgeon. The anesthesia provider and surgeon worked together to provide high quality patient care in which the patient's surgical and anesthetic needs were met or exceeded. Additionally, the anesthesia provider collaborated with the surgeon and provided timely and quality care to support the surgical services. For example, GLA providers were working with an orthopedic surgeon who had requested opioid-sparing techniques for his patients, so the anesthesia providers implemented an anesthetic technique that limited opioid use (personal communication, May 17, 2021). The orthopedic surgeon's request

offered an incentive for anesthesia providers to change practice and accept interventions to expand techniques involving opioid-free anesthetics, such as utilizing dexmedetomidine.

Because GLA offered profit-sharing in which GLA employees were part-owners of the company, the anesthesia providers had unique motivation to provide high quality patient care. Those employees who had bought into the company had a sense of pride, loyalty, and determination to foster excellence, since their monetary compensation depended on the quality of care delivered (personal communication, May 17, 2021). With the support of these key stakeholders, there was likely to be successful implementation of a quality improvement project.

Individual and Organizational Performance

Great Lakes Anesthesia providers' performances were assessed with each anesthetic delivered. Every patient received a survey to complete that assessed the quality of the anesthesia provider's services, and anesthesia providers were required to document quality outcomes for each case, such as incidence of postoperative nausea and vomiting, postoperative pain, and anesthesia-related events (personal communication, May 17, 2021). As an organization, GLA's performance was assessed by the number of contracts the company held, which was largely dependent on patient and surgeon satisfaction (personal communication, May 17, 2021). Especially if satisfaction scores were low, GLA providers were willing to change practice to improve performance scores.

Change Strategy

The focus of this project was to facilitate a change in anesthesia provider practice at an individual level: to improve knowledge and use of dexmedetomidine. However, an organizational assessment of GLA was necessary to understand the culture and climate in which the providers practiced as well as the motivation factors, resource allocation, and individual

values of the providers so that implementation of the DNP project could be strategically planned. To facilitate implementation and understand change, change theory was applied to the organization.

While many change strategies exist, one strategy may not suffice in facilitating change, so a mixture of change strategies was recommended (Nickols, 2016). Therefore, this project utilized a mixture of normative re-educative strategy and empirical-rational strategy to facilitate implementation of the quality improvement DNP project. With the understanding that people adhered to cultural values, the normative re-educative strategy implied that people followed the example of charismatic and dynamic leadership and the norms of an organization while willing to adapt to new ideas (Nickols, 2016). However, if leadership and its people were not agreeable, then the people were resistant to change (Nickols, 2016). On the other hand, the empirical-rational strategy implied that people would follow their self-interest and can be reasoned with to change if the benefit outweighs the risk (Nickols, 2016). Additionally, people were influenced to change by open communication and incentives; however, if the change was not proven to be "worth it" and the benefits of change did not outweigh the risks, resistance to change occurred (Nickols, 2016). Understanding both change strategies assisted in implementing change for GLA providers.

For GLA, the mission was to provide the highest quality patient care, and the culture was one of anesthesia provider excellence. Great Lakes Anesthesia's leadership and management supported the employees with encouragement and resources, while the company's structure facilitated provider independence. Because GLA's leadership and providers had a harmonious relationship, these providers were willing to accept change and implementation of the quality improvement project. Additionally, the DNP quality improvement project was based on

systematic reviews and meta-analyses, providing the highest levels of evidence, and demonstrating use of dexmedetomidine outweighing the potential risk. Therefore, anesthesia providers who followed self-interest were more likely to accept a change in individual practice. The DNP project leader garnered the support of GLA leadership for implementation of the DNP project, and the DNP project leader provided strengths and limitations of the evidence. These actions addressed components of the normative-re-educative strategy as well as the empirical-rational strategy, which facilitated the change process.

Leadership Style & Interprofessional Collaboration

Because GLA fostered a culture of provider excellence and of doing the right thing for the patient, anesthesia providers at GLA were willing and ready to accept change. To facilitate implementation of evidence-based practice change, the DNP project leader needed to be a dynamic leader, readily available and communicate openly with GLA providers, noting benefits as well as limitations to the evidence and responding efficiently to inquiries. As leaders of the perioperative area, GLA providers were respected and determined to deliver the highest quality patient care. These providers worked under a shared leadership model, where the head of the organization worked alongside providers and valued each CRNA's input. Great Lakes Anesthesia's leader embraced a transformational leadership style and empowered providers to perform at peak levels, while the profit-sharing anesthesia providers felt personal responsibility to the organization and encourage growth and change. The DNP project leader anticipated GLA's leader to actively participate in encouraging other GLA providers to participate in the evidence-based practice change. Additionally, the DNP project leader collaborated with pharmacy to make dexmedetomidine more readily available to anesthesia providers by stocking

the medication in the main operating room, which assisted in anesthesia provider willingness to learn and change their practice.

Conflict Management Strategies

When conflict arose for GLA providers, the CRNAs and physician anesthesiologists handled the conflict themselves and consulted their anesthesia colleagues to garner support. While readiness for change was anticipated, barriers to DNP project implementation and change in practice were anticipated. At PMC, anesthesia providers did not have ready access to dexmedetomidine, which could have hindered willingness to learn on the benefits and uses of dexmedetomidine. Additionally, GLA did not offer official educational opportunities for the employees, so implementing an educational opportunity required frequent, clear communication. Even though GLA anesthesia providers were motivated to change, ultimately, the anesthetic plan was the choice of the provider's preference, and the anesthesia provider may have chosen to not use dexmedetomidine, regardless of the evidence. Furthermore, response rate of professional communication via email among GLA providers tended to be poor (personal communication, May 17, 2021), and the response rate to the educational intervention was minimal.

These barriers were addressed by the DNP project team leader. With the assistance of the DNP project mentor, the DNP project team leader collaborated with pharmacy to make dexmedetomidine more readily available, worked with GLA leadership to facilitate implementation of the project, and communicated by email with frequent reminders of the project implementation. As conflicts formed, the DNP project team leader utilized leadership, communication, and flexibility to handle each situation.

Summary

When implementing a change in practice at the individual level, understanding the culture of an organization was essential for success because the individual reflected the organization's values. According to Burke and Litwin (1992), when contemplating change at any level of an organization, one must consider the external driving forces, mission, leadership, culture, structure, management practices, systems, climate, and task requirements of an organization as well as the individual values and motivation of the employees to understand the organizational performance and to implement change. Even though Indiana's state law hindered CRNA independence, GLA operated by a shared leadership model, which fostered a culture of excellence and a climate of respect, while promoting independent practice and providing resources for improvement in quality of care. Though barriers to implementation were anticipated, the use of change strategies as well as collaboration with leadership and pharmacy assisted in mitigating any resistance to change. Overall, GLA created a culture that was willing to learn and eager to change for the good of the patient. With the assistance from leadership at GLA and the demand from surgeons at PMC, an educational intervention for anesthesia providers on the uses and benefits of dexmedetomidine was both supported and needed.

SWOT Analysis

A strengths, weaknesses, opportunities and threats (SWOT) analysis was completed for GLA and can be found in Appendix M.

Force Field Analysis

A Force Field Analysis was completed for DNP project implementation with GLA at Plymouth Medical Center and can be found in Appendix N.

Chapter 6: Discussion

Impact of Project

Overall, the DNP scholarly project had a positive impact on GLA providers use of dexmedetomidine. Great Lakes Anesthesia (GLA) providers at Saint Joseph Health System: Plymouth Medical Center (PMC) utilized 23 vials of dexmedetomidine for patients over a three-month period. This was a substantial increase in dexmedetomidine use at PMC as GLA providers had not utilized dexmedetomidine as an anesthetic adjunct previously.

While patient outcomes were not measured in this project, patients may have benefited from the use of dexmedetomidine. Future DNP scholarly projects could build upon this DNP scholarly project and measure patient outcomes related to dexmedetomidine use, such as postoperative shivering, pain, and emergence delirium.

Decisions and Recommendations

As dexmedetomidine use increases, GLA providers should continuously assess patients receiving dexmedetomidine. Great Lakes Anesthesia providers should be aware of the side effects of dexmedetomidine, such as bradycardia and hypotension, which are consistent regardless of the route of administration. As indicated in the literature review, dexmedetomidine should be used as an adjunct to the anesthetic plan and not as the sole anesthetic. Great Lakes Anesthesia providers should stay up to date with the latest recommendations from systematic reviews and meta-analyses on dexmedetomidine use in anesthetic practice.

Limitations of the Project

Unfortunately, this DNP scholarly project was unable to measure patient outcomes related to dexmedetomidine use. While the overall use of dexmedetomidine increased, the DNP scholarly project was unable to demonstrate improved outcomes for patients at PMC.

Additionally, the DNP scholarly project did not include information on all routes of dexmedetomidine administration, specifically for epidural use and intranasal administration. The choice to not include epidural and intranasal administration was due to a lack of evidence on these routes of administration in the form of systematic reviews and meta-analyses. Further DNP scholarly projects should consider addressing patient outcomes related to dexmedetomidine use and additional routes of administration.

Application to Other Settings

The DNP scholarly project could be replicated and implemented with other anesthesia groups. However, if the DNP scholarly project were to be repeated, an in-person format for the educational intervention might be more efficacious. The DNP project team leader should also consider delivering the evidence in an alternative format as well. Additionally, an updated literature review should be completed to include the most recent evidence of dexmedetomidine use, specifically for intranasal and epidural routes of administration, as these were routes of administration the DNP project mentor requested for more information.

Strategies for Maintaining and Sustaining

With the intention to maintain and sustain the use of dexmedetomidine at PMC and among GLA providers, a virtual reference card with a summary of the various dosages and routes of dexmedetomidine was sent to all GLA providers regardless of participation in the DNP scholarly project. Additionally, the DNP mentor coordinated with the PMC pharmacist to make dexmedetomidine readily available throughout the main OR for anesthesia use. Prior to the DNP scholarly project, dexmedetomidine was only accessible by requesting the medication through pharmacy. This created a delay in administration and was an obstacle for GLA provider use. After project implementation, the PMC pharmacist stored as 4 mcg/mL in 200 mL vials located

in the main operating room medication dispenser for GLA providers to use without requesting a dose. By making dexmedetomidine freely accessible, the PMC pharmacist eliminated an obstacle for dexmedetomidine use.

Lessons Learned

Upon reflection of the DNP scholarly project, participation in the educational intervention may have been increased with an in-person implementation. At the time of planning the intervention, a virtual platform was thought to be the most efficacious due to COVID-19 restrictions and the limited number of GLA providers at PMC on a given day, and, in theory, a virtual platform could reach more GLA providers. However, the DNP project team leader was able to witness substantial effects of an in-person educational session of dexmedetomidine at an offsite interview, which suggested that an in-person educational session may have been more beneficial to the total number of participants.

Upon reflection of the chart audit, the DNP project team leader learned to utilize all resources available. The PMC pharmacist was immensely helpful in completing the retrospective and prospective chart audits. The PMC pharmacist saved the DNP project team leader time, energy, and resources. The DNP project team leader would recommend future DNP project team leaders to explore every option of assistance to facilitate implementation of the project.

The American Association of Colleges of Nursing (AACN) (2006) described practice-focused doctoral programs, such as a nurse anesthesia programs, as the highest level of education for nursing that incorporated evidence into practice. To ensure standardized education at the doctoral level, the AACN created a comprehensive list of eight foundational components that each practice-focused doctoral program must meet to ensure safe nursing practice and to deliver quality patient care (AACN, 2006). These foundational components were known as the DNP

Essentials. Through implementation of the DNP scholarly project, the DNP project team leader incorporated all eight DNP Essentials.

- Essential I: Scientific Underpinnings for Practice. The DNP project team leader attended multiple Indiana Association of Nurse Anesthesia (INANA) and American Association of Nurse Anesthesiology (AANA) conferences, which delivered content on evidence-based practices in anesthesia. The DNP project team leader recorded numerous hours constructing, appraising, evaluating, and synthesizing literature on dexmedetomidine.
- Essential II: Organizational and Systems Leadership for Quality Improvement and Systems Thinking. The DNP project team leader conducted a comprehensive SWOT analysis and Burke and Litwin organizational assessment of Great Lakes Anesthesia (GLA). The DNP project team leader also collaborated with a GLA certified registered nurse anesthetist (CRNA) to assist with a change within the facility and anesthesia group.
- Essential III: Clinical Scholarship and Analytical Methods for Evidence-Based Practice. The DNP project team leader attended meetings with the DNP project advisor each semester as well as initiated emails and phone calls with the DNP project mentor throughout the entirety of the DNP project. The DNP project team leader collected demographic and quantitative data and analyzed this data to enhance the DNP scholarly project. In addition, the DNP project team leader dedicated numerous hours preparing the DNP manuscript and presented an executive summary of the DNP scholarly project to the University of Saint Francis' Institutional Review Board as well as GLA's CEO for review and approval.

- Essential IV: Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Health Care. The DNP project team leader extracted data from large data sets related to medication administration at Parkview healthcare facilities. The DNP project team leader evaluated data collected on controlled substance use and compliance with scanning medications before administration.
- Essential V: Health Care Policy for Advocacy in Health Care. The DNP project team leader was an active member of the INANA and AANA and served on the INANA board as the student representative for the USF Nurse Anesthesia Program for two years. As a student representative on the INANA board, the DNP project team leader advocated for the nurse anesthesia profession at the state level.
- Essential VI: Interprofessional Collaboration for Improving Patient and Population Health Outcomes. The DNP project team leader attended interactive conferences focused on interprofessional collaboration with nurse practitioners, pharmacists, physical therapists, and other healthcare professionals. In addition, the DNP project team leader collaborated with the Plymouth Medical Center (PMC) pharmacist to gather data on dexmedetomidine use by GLA providers at PMC.
- Essential VII: Clinical Prevention and Population Health for Improving the Nation's Health. The DNP project team leader identified gaps in the healthcare related to heart disease in the rural, low-income, and diverse ethnic communities in the state of Indiana. The DNP project team leader utilized the logic model to outline a plan to educate local, high school students on heart disease.

- Essential VIII: Advanced Nursing Practice. The DNP project team leader completed over 2,000 clinical hours and greater than 600 cases in the nurse anesthesia practice setting. The DNP project team leader disseminated the DNP scholarly project to USF faculty on June 24, 2022. After dissemination to USF faculty, the DNP project team leader disseminated the DNP scholarly project to the DNP project mentor at GLA.

Chapter 7: Conclusion

Potential Project Impact on Health Outcomes Beyond Implementation Site

The DNP scholarly project impacted health outcomes beyond Great Lakes Anesthesia (GLA) and Saint Joseph Health Systems: Plymouth Medical Center (PMC). The DNP project team leader was able to share findings of the DNP scholarly project with anesthesia providers in another facility with immediate effects. In addition, the DNP project mentor reported positive outcomes at another GLA facility.

While at an interview in another state, the DNP project team leader discussed the DNP scholarly project with anesthesia providers in the operating room. The facility had recently stocked dexmedetomidine in the pharmacy, and the anesthesia providers were unfamiliar with uses and benefits of dexmedetomidine. As the DNP scholarly project team leader was shadowing in the operating room, the anesthesia providers immediately requested dexmedetomidine from the pharmacy to administer dexmedetomidine as an intravenous anesthetic adjunct for a patient undergoing a total knee arthroplasty. Prior to dexmedetomidine administration, the patient was hypertensive, tachycardic, and obstructing the airway due to a combination of the patient's large body habitus and the large dose of propofol used to maintain sedation. Once dexmedetomidine was administered, the patient's blood pressure and heart rate returned to baseline, the propofol dose was decreased, and the patient was able to rest comfortably without obstruction of the airway.

Even though PMC did not report utilization of dexmedetomidine in subarachnoid blocks or peripheral nerve blocks, the DNP project mentor reported use of dexmedetomidine as an anesthetic adjunct at another GLA facility. For subarachnoid blocks, the DNP project mentor described the effects of dexmedetomidine to prolong the duration of action of both sensory and

motor (personal communication, March 9, 2022). For peripheral nerve blocks, the DNP project mentor reported positive outcomes in reduction of postoperative pain for patients with interscalene peripheral nerve blocks for shoulder surgery (personal communication, March 9, 2022).

Health Policy Implications of Project

There were no health policy implications of the DNP scholarly project.

Proposed Future Direction for Practice

The DNP scholarly project has the potential to be distributed and shared to other anesthesia providers throughout the anesthesia community. For example, the DNP scholarly project findings could be shared at anesthesia gatherings at the state or national level. Future DNP students could build upon this DNP scholarly project by adding literature related to additional uses of dexmedetomidine in anesthetic practice, such as an additive to epidurals for labor analgesia or intranasal administration to treat preoperative anxiety. In addition, future DNP students could examine patient outcomes related to dexmedetomidine use as an anesthetic adjunct, such as the incidence of postoperative shivering, postoperative pain, and preoperative anxiety, and report on those findings.

Overall, dexmedetomidine is a valuable adjunct to anesthetic practice, and an educational intervention on the various uses and benefits improved anesthesia provider knowledge and use of dexmedetomidine.

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Appendix A: Collaborate Institutional Training Initiative

Completion Date 12-Feb-2021
Expiration Date 12-Feb-2024
Record ID 40945367

This is to certify that:

Morgan Stuut

Has completed the following CITI Program course:

Not valid for renewal of certification through CME.

GCP – Social and Behavioral Research Best Practices for Clinical Research
(Curriculum Group)
GCP – Social and Behavioral Research Best Practices for Clinical Research
(Course Learner Group)
1 - Basic Course
(Stage)

Under requirements set by:

University of Saint Francis

Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?wd593171d-58fc-42d1-810a-4aee05b3ab22-40945367

CITI PROGRAM

Completion Date 21-Feb-2021
Expiration Date 21-Feb-2024
Record ID 40945366

This is to certify that:

Morgan Stuut

Has completed the following CITI Program course:

Not valid for renewal of certification through CME.

Social and Behavioral Responsible Conduct of Research
(Curriculum Group)
Social and Behavioral Responsible Conduct of Research
(Course Learner Group)
1 - RCR
(Stage)

Under requirements set by:

University of Saint Francis

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w1f09f545-91a4-424e-af73-7843e361660a-40945366

CITI PROGRAM

Completion Date 21-Feb-2021
Expiration Date 21-Feb-2024
Record ID 40945364

This is to certify that:

Morgan Stuut

Has completed the following CITI Program course:

Not valid for renewal of certification through CME.

Social & Behavioral Research - Basic/Refresher
(Curriculum Group)
Social & Behavioral Research
(Course Learner Group)
1 - Basic Course
(Stage)

Under requirements set by:

University of Saint Francis

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?wfb478da6-c436-4824-871c-b9a12081d9bf-40945364

CITI PROGRAM

Completion Date 13-Feb-2021
Expiration Date N/A
Record ID 40945365

This is to certify that:

Morgan Stuut

Has completed the following CITI Program course:

Not valid for renewal of certification through CME.

Information Privacy Security (IPS)
(Curriculum Group)
Researchers
(Course Learner Group)
1 - Basic Course
(Stage)

Under requirements set by:

University of Saint Francis

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?wbe55b22e-f664-4c1a-8b51-9037fdc6160f-40945365

CITI PROGRAM

Completion Date 13-Feb-2021
Expiration Date 13-Feb-2024
Record ID 40945368

This is to certify that:

Morgan Stuut

Has completed the following CITI Program course:

Not valid for renewal of certification through CME.

Public Health Research
(Curriculum Group)
Public Health Research
(Course Learner Group)
1 - Basic
(Stage)

Under requirements set by:

University of Saint Francis

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w9b2718c4-dc18-4de2-9bb2-ce6bfa260659-40945368

Appendix B: USF IRB Approval Letter

University of Saint Francis
Institutional Review Board
Human Subjects Review Committee/ACUC/IBC
Institutional Review Board Approval Form

Protocol Number: 16325793784
Reviewed by (underline one): HSRC ACUC IBC
Date Reviewed: Monday, October 25, 2021
Principal Investigator: Morgan Stuut
Faculty Advisor: Dr. Meagan Winegarden
Protocol Title: Addressing Barriers to Dexmedetomidine Use
Study Site(s): University of Saint Francis, Main Campus

Type of Proposal:
☐Original research
☐ Replication or extension of previous research
☒Quality Improvement/Evidence-Based Practice Project

Items submitted for review:
☒CITI Certificate
☒Initial protocol
☒Abstract
☒Informed Consent Form (if applicable)
☒Approval letter from outside institution
☐Other – explain: Email request was made for waiver

Type of Review:
☒Full Review
☐Expedited Review
☐Exempt Review

Approval:
☒Approval granted on Monday, October 25, 2021 for a period of one year.
☐Conditional approval* granted on _____for a period of one year.
☐Not approved*
☐IRB approval is not required:
☐Other

*Comments:

The committee performing this review is duly constituted and operates in accordance and compliance with local and federal regulations and guidelines.

Michael P. Bechill, IRB Chair	Michael P. Bechill	2021.10.25
Printed Name (Chair or designee)	Signature	Date

IRB Committee Approval Form mpb 01/01/2021

Appendix C: USF Faculty Approval

Policy 4.15.1
Created June 2019

DNP Scholarly Project Proposal Initial Approval

TO: Caitlin Krouse, DNP, FNP-BC, RN
Assistant Professor and Graduate Nursing Program Director

FROM: Morgan Stuut, BSN, RN, DNP-NAP Student

RE: DNP Project Proposal Review Council Endorsement

DATE: November 11, 2021

DNP Scholarly Project Title:

Addressing Barriers to Dexmedetomidine Use in Anesthesia Practice: Provider Education

DNP Scholarly Project Review Council:

DNP Project Advisor Signature: _____
Dr. Megan Winegarden

DNP Project Proposal Review Council Member Signature: Susan Lown, DNP, RN, CNE
Dr. Susan Lown

DNP Project Proposal Review Council Member Signature: _____
Dr. Greg Louck

Date of initial approval to implement: November 11, 2021

1 - Student File
3 - Attached to Proposal

6-2019. Rev. 11-2021

Appendix D: General Timeline

Addressing Barriers to Dexmedetomidine Use: Provider Education Timeline																		
	Jan. '21	**Feb. '21**	**Mar. '21**	**April '21**	**May '21**	**June '21**	**July '21**	**Aug. '21**	**Sep. '21**	**Oct. '21**	**Nov. '21**	**Dec. '21**	**Jan. '22**	**Feb. '22**	**Mar. '22**	**April '22**	**May '22**	**June '22**
Meet with Dr. Winegarden (Project Advisor) for Project Approval																		
Literature Review – Collect Systematic Reviews and Meta-Analyses																		
Establish DNP Project Team																		
Meet with Diane Madsen (Project Mentor), CRNA from Great Lakes Anesthesia (GLA) – Discuss Applicability of Project																		
Meet with Plymouth Medical Center																		

(PMC) Pharmacist																		
Meet with Dr. Winegarden for Update																		
CITI Training																		
DNP Project Proposal and PICOT Question – First Presentation																		
Meet with Dr. Winegarden for Update																		
Complete First Draft of Informed Consent																		
Conduct Organizational Assessment of GLA – Interview GLA Provider																		
Conduct SWOT Analysis of GLA																		
Conduct Force Field Analysis of GLA																		
Create Budget																		

Organize Gantt Chart for Project Timeline																		
Meet with Dr. Winegarden for Update																		
Determine Aims of Project																		
Determine Tools for Data Collection – Contact Author of Tool on Assessment of Knowledge and Confidence or Develop Specific Tool to Assess Knowledge and Confidence and Validate with Experts																		
Determine Statistical Analysis of Project – Consider Percent of Change																		

Meet with Dr. Winegarden for Update																		
Finalize Informed Consent																		
Meet with Dr. Winegarden to Review DNP Project Proposal																		
Present DNP Project Proposal to DNP faculty for Consent to Submit to IRB																		
Submit DNP Project Proposal to Saint Joseph Health System's IRB for Approval																		
Create PowerPoint Presentation, Display Board, and Reference Cards on Dex's Uses and Benefits in Anesthesia																		

Contact Diane Madsen to Discuss Details for Intervention – Location and Time																	
Meet with Dr. Winegarden to Discuss Final Details of DNP Project																	
Implement DNP Project at PMC for GLA Providers – Educational Intervention on Dex's Uses and Benefits in Anesthesia																	
Collect Data from Tools Distributed at Implementation																	
Analyze Data from Tools with Percent of Change to Assess Knowledge and Confidence of Use of Dex																	

Among GLA Providers																	
Follow Up with PMC Pharmacist to Assess Use of Dex																	
Create Final PowerPoint Presentation for Dissemination & Finalize DNP Project Manuscript																	
DNP Project Final Formal Presentation, Submission of DNP Project Manuscript & Dissemination to USF Faculty																	

Appendix E: Informed Consent

INFORMED CONSENT FORM

Addressing Barriers to Dexmedetomidine Use in Anesthesia Practice: Provider Education

Introduction and Purpose of the DNP Scholarly Project.

I am Morgan Stuut, Student Registered Nurse Anesthetist at the University of Saint Francis. Under the direction of Dr. Megan Winegarden, I am conducting a Scholarly DNP Quality Improvement Project on dexmedetomidine in anesthetic practice. I would appreciate your participation in this educational session, as it will assist in improving anesthesia provider knowledge and use of dexmedetomidine in anesthetic practice.

Questions are encouraged and may be asked at any point during the project. Participation in this project is completely voluntary, and withdrawal from the project may occur at any time.

Procedures.

1. Completion of informed consent.
2. Completion of demographic questionnaire.
3. Completion of self-generated pretest.
4. Each questionnaire will take approximately 5 minutes to complete.
5. Each participant will be asked to complete an online educational session on the uses and benefits of dexmedetomidine in anesthetic practice.
6. The educational session requires approximately 20 minutes.
7. Completion of self-generated posttest.
8. The posttest will take approximately 5 minutes to complete.
9. The total duration of the project will last approximately 30 minutes.
10. There are expected to be approximately 30 participants in the project.

Alternative Procedures.

In the event an online educational session is not feasible, an in-person educational session may be conducted to facilitate an increase in knowledge and use of dexmedetomidine in anesthetic practice.

Risk and Benefits.

1. Risks:
    a. No anticipated risks in this project.
2. Benefits:
    a. Increased knowledge of dexmedetomidine.
    b. Increased use of dexmedetomidine in anesthetic practice.
    c. Compensation in the form of patient satisfaction.
    d. Compensation in the form of improved patient outcomes. However, no direct monetary compensation will be given.

Safeguards.

1. Identifiable personal information will not be collected.
2. Participant submission of Microsoft Form will be coded with number in the order in which the form was submitted. No identifiable patient information will be associated with the coded number. Data collected will be stored on a password-protected

computer. At the conclusion of the project, all data collected will be securely disposed.
3. Data shared will have no identifiable information.

Freedom to Withdraw.

1. Participation in this project is completely voluntary.
2. Withdrawal from study may occur at any time without penalty.
3. Participation or decision to not participate will not affect treatment or involve penalty or loss of benefits of which the participant is entitled at Great Lakes Anesthesia or Saint Joseph Health Systems: Plymouth Medical Center.
4. In the event of withdrawal from project, any data collected from participant will be immediately shredded and securely disposed.

Summary.

The intention of this DNP Scholarly Quality Improvement Project is to provide an educational session on the uses and benefits of dexmedetomidine in anesthetic practice with the goal of improving anesthesia provider knowledge and use of dexmedetomidine. To demonstrate effectiveness, a questionnaire will be administered before and after the educational session, which will be conducted either in-person or online. There is no anticipated risk with benefits for anesthesia providers. Anonymity will be strictly maintained throughout the entirety of the DNP Scholarly Project. Participation is voluntary, and participants may choose to withdrawal from the project at any time.

Inquiries.

Once the DNP Scholarly Project is completed, I would be glad to share the results with participants. If any questions arise, please contact me or my project advisor at:

Morgan Stuut BSN, RN, CCRN, SRNA
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Associate Professor of Nursing
University of Saint Francis
Office Pope John Paul II 310C
(260) 399-7700 ext. 8513
mwinegarden@sf.edu

If there are any complaints or misgivings about treatment as a participant in this study, please call or write to the following:

IRB Chairperson
University of Saint Francis
2701 Spring Street
Fort Wayne, Indiana 46808

(260) 399-7700
Administration email: irb@sf.edu

I have received an explanation of this study and agree to participate. I understand that my participation in this study is strictly voluntary.

Print Name: _____

Signature: _____ Date: _____

This DNP Scholarly Project has been approved by the University of Saint Francis' Institutional Review Board for the Protection of Human Subjects for a one-year period.

Appendix F: Demographic Questionnaire

Demographic Questionnaire

Demographic information only to be used for the purpose of this quality improvement project.

Please select the appropriate answer for each of the following questions.

1. Select your gender assigned at birth:
   a. Male
   b. Female
2. Select the category that includes your age:
   a. 21-30 years
   b. 31-40 years
   c. 41-50 years
   d. 51-60 years
   e. 61 years or older
   f. I choose not to disclose
3. Select your occupation:
   a. Certified Registered Nurse Anesthetist
   b. Anesthesiologist
4. Select the category that best describes the number of years you have practiced anesthesia:
   a. Less than 1 year
   b. 1-5 years
   c. 6-10 years
   d. 11 years or more
5. Select the category that describes your contract with Great Lakes Anesthesia:
   a. W2
   b. 1099
6. Do you rotate to Plymouth Medical Center?
   a. Yes
   b. No
7. Select the types of anesthesia you administer (select all that apply):
   a. General anesthesia
   b. Subarachnoid blocks
   c. Epidurals
   d. Peripheral nerve blocks
   e. Monitored anesthesia care
   f. All of the above
8. Have you previously used dexmedetomidine in your anesthetic practice?
   a. Yes
   b. No
9. When did you first learn about dexmedetomidine?
   a. Undergraduate/graduate education

b. Evidence-based practice articles/workshop
c. Coworker/facility
d. Uncertain
e. Never heard of it

Appendix G: Pretest and Posttest

Pretest and Posttest Instrument to Assess Knowledge

Please select the correct response to the questions provided.

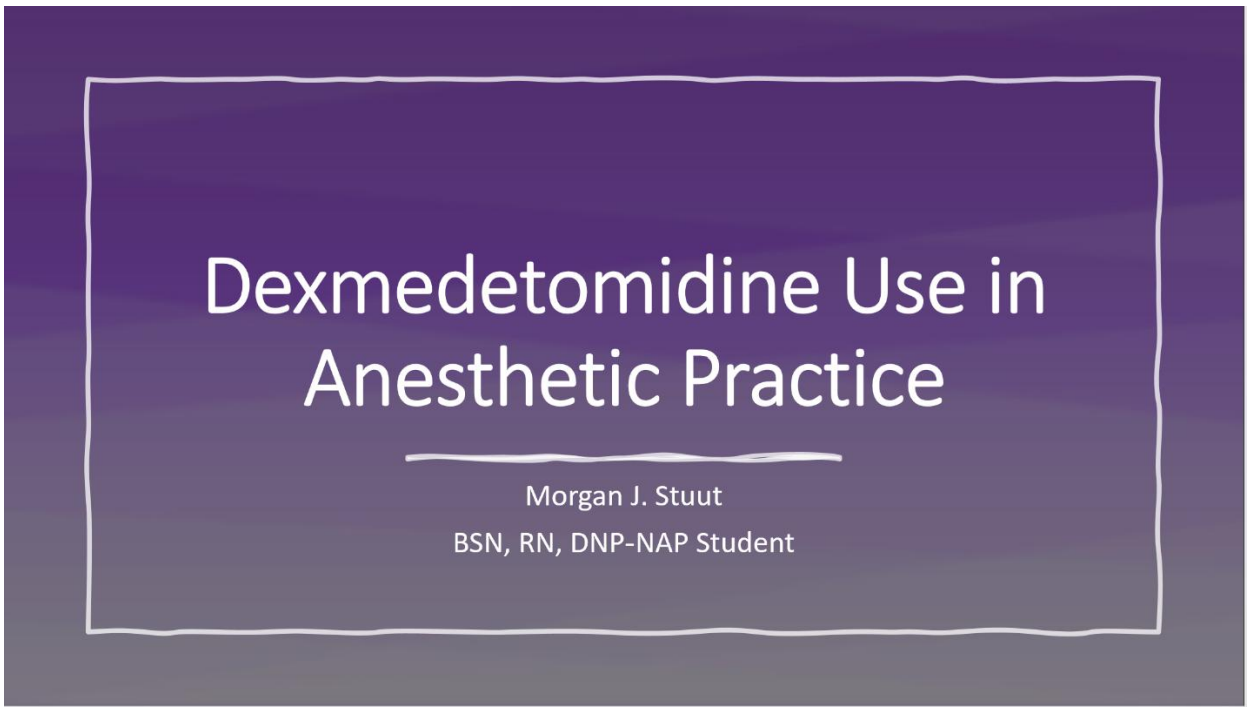
1. True or False. Dexmedetomidine is a centrally active alpha-1 adrenergic receptor agonist.
2. True or False. Dexmedetomidine has no active metabolites.
3. True or False. Dexmedetomidine inhibits the respiratory drive.
4. Dexmedetomidine dosing is based on (select one):
    a. Ideal body weight
    b. Total body weight
    c. Lean body weight
    d. None of the above
5. Dexmedetomidine side effects include all the following except (select one):
    a. Hypotension
    b. Bradycardia
    c. Delayed recovery
    d. Nausea
6. A 31-year-old female gravida 2 para 1 with no significant medical history is scheduled for a repeat cesarean section. The patient complained of pruritis with her previous "spinal block" and wishes to avoid that side effect this time. To avoid pruritis, the anesthesia provider plans to substitute an intrathecal opioid for intrathecal dexmedetomidine to prolong the duration of the subarachnoid block. Based on the literature, what is the recommended dose of intrathecal dexmedetomidine as an adjunct to local anesthetics in a subarachnoid block (select one)? (S. Liu et al., 2020; Y. Wang et al., 2019)
    a. 2 mcg
    b. 5 mcg
    c. 10 mcg
    d. 20 mcg
7. A 57-year-old male with a history of hypothyroidism, hyperlipidemia, and hypertension is scheduled for a right rotator cuff repair. The patient weighs 92 kg with a BMI of 33.1 kg/m^2 and presents with the following vital signs: BP 147/74, HR 78, RR 16, 97% SaO_2 on room air. The anesthesia provider plans on administering a preoperative right interscalene block for postoperative pain management. Based on the literature, what is the recommended dose of dexmedetomidine when used as an adjunct to local anesthetics for an interscalene block (select one)? (Vorobeichik et al., 2017)
    a. 5 mcg
    b. 10 mcg
    c. 50 mcg
    d. 100 mcg

8. An 8-year-old female with a history of autism is scheduled for a full mouth dental repair. The patient weighs 25 kg with a BMI of 18 kg/m^2. The patient is induced, ETT is secured, and presents with the following vital signs after induction: BP 98/56, HR 105, RR 24, 98% SaO_2 with FiO_2 of 0.4. To prevent emergence delirium, the anesthesia provider plans to administer an intravenous dose of dexmedetomidine over 10 minutes immediately following induction. According to the literature, what is the recommended dose of dexmedetomidine when used to prevent emergence delirium in this pediatric patient (select one)? (Manning et al., 2020)
    a. 12.5 mcg
    b. 25 mcg
    c. 50 mcg
    d. 100 mcg

Answer Key

1. False (alpha-2)
2. True
3. False
4. B
5. D
6. B
7. C
8. A

Appendix H: Educational PowerPoint



Objectives

- Identify the uses of dexmedetomidine in anesthetic practice
- Recognize the mechanism of action of dexmedetomidine
- List the side effects of dexmedetomidine
- Determine the recommended subarachnoid dose of dexmedetomidine
- Determine the recommended peripheral nerve block dose of dexmedetomidine to prolong the duration of analgesia
- Calculate the recommended intravenous dose of dexmedetomidine to prevent emergence delirium in pediatric patients

Introduction to Dexmedetomidine

- Approved for clinical practice in 1999
- Initially used for short-term sedation for mechanically ventilated adult patients in intensive care units (Miller et al., 2015)
- Properties:
  - Sedative
  - Anxiolytic
  - Analgesic
  - Sympatholytic effects without inhibition of the respiratory drive (Nagelhout & Elisha, 2018)

Mechanism of Action

- Highly selective alpha$_2$ adrenergic agonist (Miller et al., 2015; Prodigy anesthesia, 2021)
  - Selectivity ratio for alpha$_2$ to alpha$_1$ – 1600:1

- Three subtypes of alpha$_2$ receptors
  - Alpha$_{2a}$: peripheral
    - Post-synaptic blood vessels → vasoconstriction (transient HTN)
    - Pre-synaptic blood vessels → inhibit NE release & attenuates vasoconstriction (HoTN)
  - Alpha$_{2b}$: central
    - Brain & spinal cord
  - Alpha$_{2c}$: central
    - Brain & spinal cord

Mechanism of Action (cont.)

- Sedation
  - Decreases release of NE from presynaptic receptors in locus coeruleus
  - No effect on GABA → natural sleep patterns

- Analgesia
  - Agonism of $alpha_{2a}$ & $alpha_{2c}$ receptors in dorsal horn of spinal cord
    - Decreases release of glutamate & substance P
    - Hyperpolarizes interneurons
  - Decreases MAC & opioid requirements
  - Prolongs hyperpolarization of C fibers (PNBs)

Metabolism & Pharmacokinetics

- Complete biotransformation by liver
- No active metabolites
- 94% protein-bound
- Longer duration of sedation in renal failure
  - Due to decreased protein binding
- Elimination ½ time: 2-3 hours
- Context-sensitive ½ time:
  - 4 minutes after 10-minute infusion
  - 250 minutes after 8-hour infusion
- Dosing based on total body weight

Side Effects

- Hypotension
- Bradycardia
- Oversedation
- Delayed recovery

Subarachnoid Blocks

- Significantly prolonged duration of both sensory and motor blockade (Li et al., 2019; S. Liu et al., 2020; Zhang et al., 2017)
  - 71 RCTs & 4627 patients
- Prolonged the time to first postoperative analgesic requirement by approximately 217 minutes (S. Liu et al., 2020)
  - 25 RCTs & 1478 patients
- Less pruritis compared to fentanyl (Sun et al., 2017)
  - 9 RCTs & 639 patients

SABs (cont.)

- Administer 5 mcg of dexmedetomidine in addition to the local anesthetic dose in the subarachnoid space (S. Liu et al., 2020; Y. Wang et al., 2019)
- Avoid dexmedetomidine as a neuraxial adjuvant if procedures are less than 60 minutes in duration (Li et al., 2019)
  - Due to the prolongation of motor blockade
- Further studies need to be conducted to assess neurotoxicity and long-term complications associated with intrathecal dexmedetomidine administration (S. Liu et al., 2020)

Peripheral Nerve Blocks

- Prolonged the duration of sensory and motor blockade in brachial plexus PNBs (Vorobeichik et al., 2017)
  - Sensory – 3.8 hours
  - Motor – 10.1 hours
  - 32 RCTs & 2,007 patients
- Prolonged analgesia up to 11.9 hours with a reduction in the average postoperative oral morphine consumption by 10.2 mg (Vorobeichik et al., 2017)
  - 7 RCTs & 546 patients

PNBs (cont.)

- Administer a dose of 50-60 mcg of dexmedetomidine to local anesthetics for brachial plexus PNBs (Vorobeichik et al., 2017)
  - Maximize analgesic benefit & minimize bradycardia/hypotension
- Evaluate risks and benefits of prolonged motor blockade as well consideration and adequate monitoring of the potential adverse effects, such as bradycardia and hypotension (Vorobiechik et al., 2017)
- Level of evidence for lower extremity nerve blocks was relatively low

Adult Perioperative Shivering

- Regardless of route, dexmedetomidine demonstrated a consistent reduction in perioperative shivering (Li et al., 2019; S. Liu et al., 2020; X. Liu et al., 2019; Miao et al., 2018; Paramasivan et al., 2020; G. Wang et al., 2016; J. Wang et al., 2020; Zhang et al., 2017)
  - 135 RCTS & 8,704 patients
- Administer 5 mcg of dexmedetomidine intrathecally to be the most efficacious (S. Liu et al., 2020; X. Liu et al., 2019; Miao et al., 2018; Zhang et al., 2017)

Adult Perioperative Shivering (cont.)

- Further studies need to be conducted on the dosing of both epidural and intravenous dexmedetomidine specifically for the prevention and treatment of perioperative shivering.
- More studies are needed to assess the clinical significance of bradycardia and hypotension with dexmedetomidine administration as well as the potential neurotoxicity (Miao et al., 2018; Zhang et al., 2017)

Adult Postoperative Delirium

- Dexmedetomidine can reduce the incidence of postoperative delirium in adult surgical patients (Duan et al., 2018; Janssen et al., 2019; Ming et al., 2020; H. Pan et al., 2019; Peng et al., 2019; Zeng et al., 2019)
  - 107 studies & ~30,000 patients

Adult Postoperative Delirium (cont.)

- Administer bolus dose of 0.5-1.0 mcg/kg of dexmedetomidine 60 minutes prior to the end of surgery (Duan et al., 2018; Janssen et al., 2019; Pavone et al., 2018)
- Followed by an infusion from 0.2-0.7 mcg/kg/hr up to 24 hours postoperatively (Duan et al., 2018; Janssen et al., 2019; Pavone et al., 2018)
- Additional studies needed to determine both optimal dose and timing of administration to prevent postoperative delirium while minimizing risk of hypotension and bradycardia (Duan et al., 2018; Ming et al., 2020; Zeng et al., 2019)

Pediatric Considerations

- Preoperative Anxiety
  - Intranasal dexmedetomidine did not demonstrate a reduction in emergence delirium compared to other agents (Juan et al., 2017)
- Postoperative Emergence Delirium
  - Reduced the incidence of postoperative delirium (Lang et al., 2020; Manning et al., 2020)

Pediatric Considerations (cont.)

- Administer intravenous bolus dose of 0.5 mcg/kg administered immediately following induction (Manning et al., 2020)
  - To prevent emergence delirium in the pediatric patient
- The literature has called for future large, double-blinded RCTs that evaluate intranasal dexmedetomidine in treatment of preoperative anxiety and prevention of postoperative emergence delirium (Fitzsimons et al., 2017; Jun et al., 2017)
  - Safety
  - Efficacy
  - Dosing

Indication	Recommendation
Subarachnoid Blocks (S. Liu et al., 2020; Y. Wang et al., 2019)	5 mcg + LA of choice Avoid if procedure <60 minutes
Peripheral Nerve Blocks (Vorobeichik et al., 2017)	50-60 mcg + LA of choice (Brachial Plexus PNBs)
Shivering iu et al., 2020; X. Liu et al., 2019; Miao et al., 2018; Zhang et al., 2017)	5 mcg intrathecally
Postoperative Delirium (Duan et al., 2018; Janssen et al., 2019; Pavone et al., 2018)	Loading Dose: 0.5-1 mcg/kg IV (60 minutes prior to end of surgery) Continuous Infusion: 0.2-0.7 mcg/kg/hour IV (Following loading dose & up to 24 hours postop)
Pediatric Emergence Delirium (Manning et al., 2020)	Loading Dose: 0.5 mcg/kg IV (Immediately following induction)

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Appendix I: Data Collection Forms

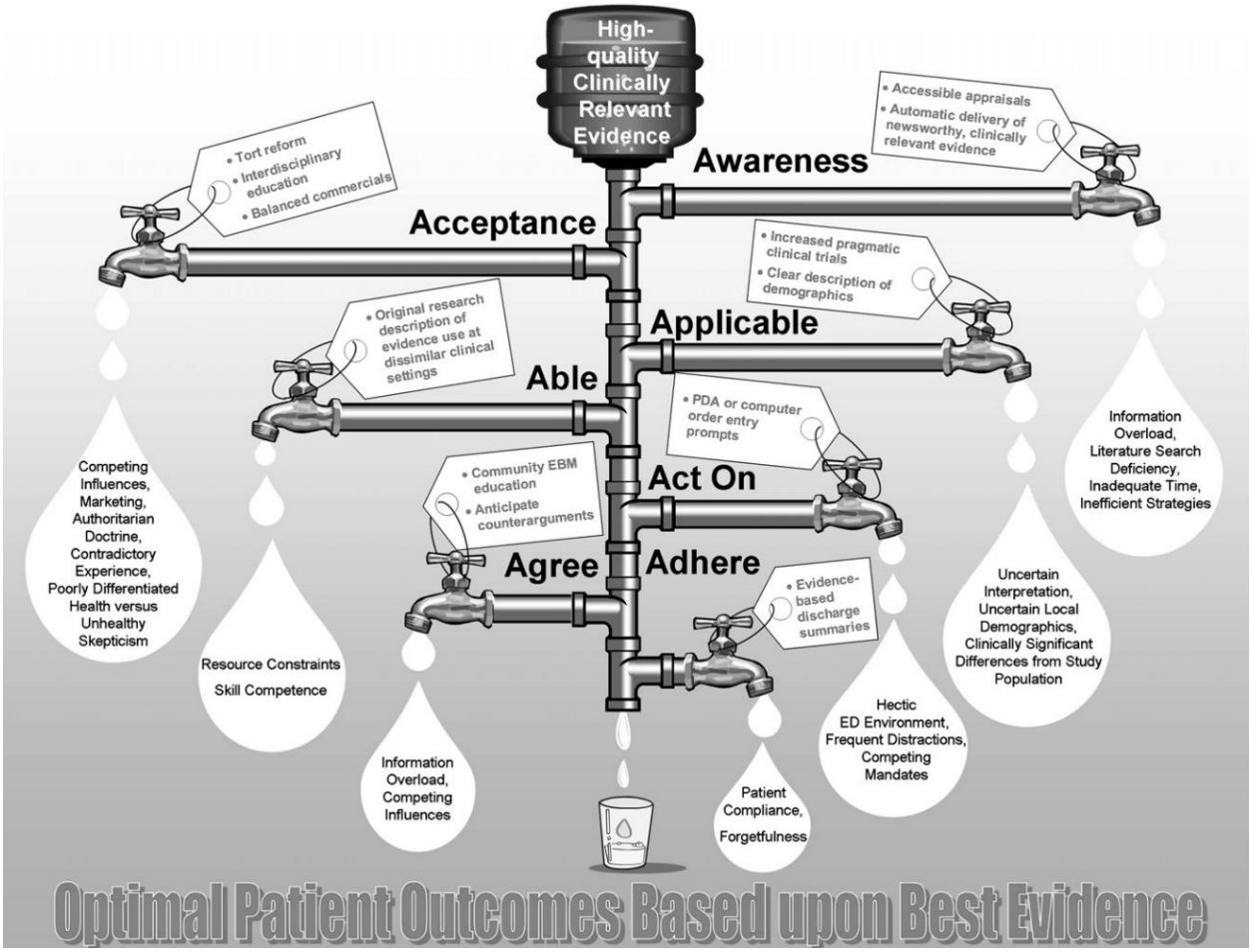
Data Collection Form										
Demographic Information									Measure of Knowledge	
Participant #	**Gender**	**Age**	**Occupation**	**Experience**	**Contract**	**Employment Status**	**Anesthesia**	**Dex Awareness**	**Pretest Score (Before Intervention)**	**Posttest Score (After Intervention)**

Data Collection Form – Prospective Chart Audit (3 months after intervention)			
# Of Dex vials administered	**# Of SAB with Dex as adjunct**	**# Of PNB with Dex as adjunct**	**# Of IV infusions of Dex**

Data Collection Form – Pretest Results								
Participant #	**Question #1**	**Question #2**	**Question #3**	**Question #4**	**Question #5**	**Question #6**	**Question #7**	**Question #8**

Data Collection Form – Posttest Results								
Participant #	**Question #1**	**Question #2**	**Question #3**	**Question #4**	**Question #5**	**Question #6**	**Question #7**	**Question #8**

Appendix J: Pathman's Pipeline



(Diner et al., 2007).

Appendix K: Facility Approval to Implement

Saint Joseph Health System Plymouth Medical Center Approval

SAINT JOSEPH HEALTH SYSTEM

9/1/21

To the University of Saint Francis Institutional Review Board:

This letter is being written in support of University of Saint Francis NAP/DNP Morgan J. Stuut Doctor of Nursing Practice Project Scholarly Project entitled Addressing Barriers to Dexmedetomidine Use in Anesthesia Practice: Provider Education. Saint Joseph Health System: Plymouth Medical Center understands that the aims of the DNP Scholarly Project are to increase anesthesia provider knowledge on the uses and benefits of dexmedetomidine in anesthetic practice and increase use of dexmedetomidine as an anesthetic adjunct at Saint Joseph Health System: Plymouth Medical Center.

Saint Joseph Health System: Plymouth Medical Center is supportive of the aims of the project. Saint Joseph Health System: Plymouth Medical Center is supportive of the aims of this project. Saint Joseph Health System: Plymouth Medical Center will allow access to electronic medical records chart audit purposes, if necessary. **Saint Joseph Health System: Plymouth Medical Center does not require the DNP project to go through its institutional IRB**.

Saint Joseph Health System: Plymouth Medical Center is supportive of this DNP project and committed to aiding Morgan Stuut's DNP Scholarly Project Addressing Barriers to Dexmedetomidine Use in Anesthesia Practice: Provider Education.

Sincerely,

Creighton Kaiser

Creighton Kaiser, PharmD
Pharmacy Manager
kaisercd@sjrmc.com
574-948-4305

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Plymouth Medical Center
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St. Paul's
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South Bend, IN 46614
574.284.9000

Trinity Tower
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South Bend, IN 46601
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Community-Based Programs

The Foundation
707 E. Cedar St., Ste. 175
South Bend, IN 46617
574.335.4540

Health Insurance Services
5215 Holy Cross Pkwy.
Mishawaka, IN 46545
855.88.SJMED (855.887.5633)

Outreach Services
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Mishawaka, IN 46544
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Physician Network
707 E. Cedar St., Ste. 200
South Bend, IN 46617
574.335.8758

Great Lakes Anesthesia Approval

Great Lakes Anesthesia, P.C.

August 28, 2021

To the University of Saint Francis Institutional Review Board:

This letter is being written in support of University of Saint Francis NAP/DNP Morgan Stuut's Doctor of Nursing Practice Project Scholarly Project entitled Addressing Barriers to Dexmedetomidine Use in Anesthesia Practice: Provider Education. Great Lakes Anesthesia understands the aims of the DNP Scholarly Project are to increase anesthesia provider knowledge on uses and benefits of dexmedetomidine in anesthetic practice and increase the administration of dexmedetomidine as an adjunct to anesthetic practice.

Great Lakes Anesthesia is supportive of the aims of this project. Great Lakes Anesthesia will allow distribution of surveys and educational intervention to anesthesia providers and allow access to electronic medical records chart audit purposes. **Great Lakes Anesthesia does not require the DNP project to go through its institutional IRB**.

Great Lakes Anesthesia is supportive of this DNP project and committed to aiding Morgan Stuut's DNP Scholarly Project Addressing Barriers to Dexmedetomidine Use in Anesthesia Practice: Provider Education.

Sincerely,

Seth Claxton

CEO

Great Lakes Anesthesia

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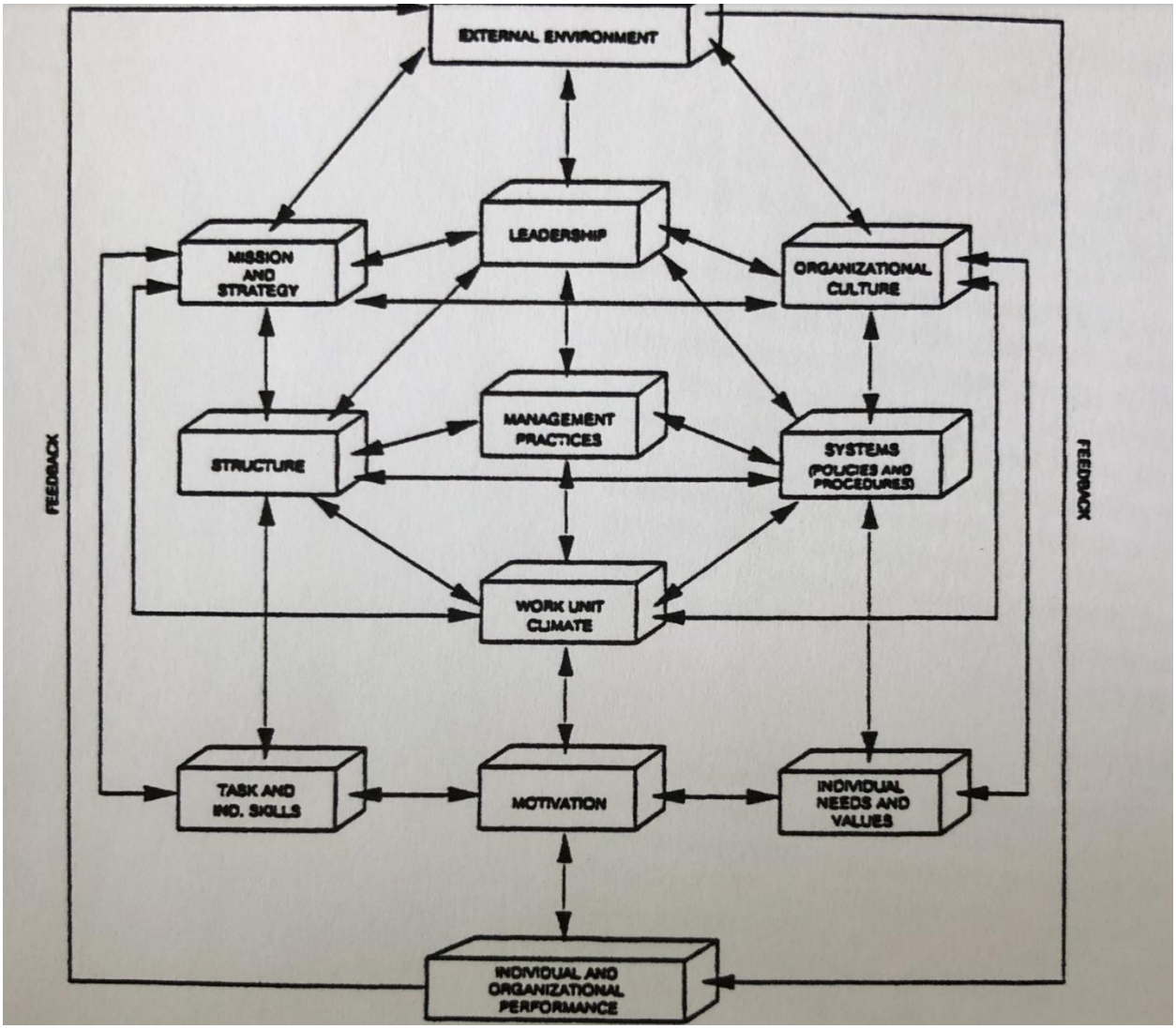
574-575-8666

Appendix L: Burke and Litwin Model

Burke and Litwin Model: A Model for Organizational Performance and Change



(Burke & Litwin, 1992).

Appendix M: SWOT Analysis

SWOT Analysis

Strengths	**Weaknesses**
• Shared leadership model • Culture of excellence • Profit sharing employees invested in organization's reputation • GLA values CRNA independence • Anesthesia providers open to new ideas for anesthetic plan • Quality patient care is the goal of all anesthesia providers	• GLA does not offer educational opportunities for CRNAs • GLA does not host organizational meetings to gather anesthesia providers • GLA providers report ineffective email communication among anesthesia providers
Opportunities	**Threats**
• Surgeons requesting opioid-sparing anesthetic plan • CRNAs determine anesthetic plan and can choose to change their practice • Pharmacy willing to collaborate and make dexmedetomidine more readily available • Stakeholders requesting formal educational presentation on dexmedetomidine	• GLA CRNAs feel physician anesthesiologists of organization will be resistant to educational opportunity provided by student registered nurse anesthetist • Provider preference to not use dexmedetomidine • Perceived higher cost of dexmedetomidine • Stakeholders presenting on dexmedetomidine before DNP project implementation • Dexmedetomidine is not stored in the Pyxis at Plymouth Medical Center and must be requested through pharmacy

Appendix N: Force Field Analysis

Force Field Analysis

Forces		
For (Driving Forces)	**Against (Restraining Forces)**	**Action to Be Taken**
Surgeons at Plymouth Medical Center (PMC) are requesting opioid-sparing anesthetic plan, which creates an incentive for GLA providers to expand anesthetic technique, such as incorporating dexmedetomidine into practice.	Great Lakes Anesthesia (GLA) Certified Registered Nurse Anesthetists (CRNAs) believe physician anesthesiologists will be resistant to participate in student CRNA-driven educational intervention (personal communication, May 17, 2021) because the American Society for Anesthesiologists (ASA) is notorious for creating barriers to student CRNA education, such as limiting access to clinical facilities (AANA, n.d.).	Discuss strategies with owner and board members of GLA to incentivize physician anesthesiologists to participate in implementation of DNP project. Discover surgeons' anesthetic preferences and include opioid-sparing techniques, incorporating dexmedetomidine to fit surgeon's request, such as dexmedetomidine's role in regional anesthesia.
GLA stakeholders are requesting educational presentation on various uses of dexmedetomidine in anesthetic practice.	GLA stakeholders have mentioned developing their own presentation on dexmedetomidine, which would reduce the effectiveness of DNP project implementation and skew the project's findings because GLA providers would increase knowledge and confidence of use before DNP project implementation.	Communicate openly, honestly, and frequently with stakeholders on DNP project content and timeline. Meet with stakeholders and ask about content they wish to be presented and incorporate this content into project.
Pharmacy is willing to make dexmedetomidine more available, which could increase GLA provider likelihood of incorporating dexmedetomidine into their anesthetic plan.	Dexmedetomidine access is limited, and barriers exist to obtaining dexmedetomidine. To use dexmedetomidine for a case, GLA providers must reach out to pharmacy and rely on pharmacists to either deliver the concentrated medication or dilute the medication into an acceptable concentration for use.	Collaborate with pharmacy to stock concentrated dexmedetomidine in the main OR Pyxis and allow providers the ability to dilute medication. Collaborate with pharmacy to alter concentrations of dexmedetomidine into more cost-effective and ready-to-use doses.

GLA's owner and board members are supportive of both organizational and provider growth and change and are ready for DNP project implementation.	GLA does not offer educational opportunities through the organization (personal communication, May 17, 2021). GLA reimburses providers for self-learning opportunities, such CEUs and conferences (personal communication, May 17, 2021).	Create an opportunity with incentives for GLA providers to attend DNP project implementation, such as lunch during implementation. Collaborate with GLA's owner and board members to encourage providers to attend.
GLA encompasses a culture of excellence, which may increase likelihood of providers attending DNP project implementation to improve practice.	GLA does not host meetings to gather anesthesia employees, and GLA providers are not consistently at PMC because they rotate to other facilities. This creates a barrier for implementation because there is not a designated or convenient time to gather all GLA providers in one setting.	Collaborate with GLA owner and board members to create a meeting for DNP project implementation. Emphasize how dexmedetomidine contributes to excellence, such as positive outcomes and improved patient and provider satisfaction.
GLA values CRNA independence, which allows CRNAs the ability to create their own anesthetic plan and choose to incorporate a new anesthetic technique, such as adding dexmedetomidine to regional nerve blocks.	GLA board members believe the email response rate to organizational memos to be poor among GLA providers (personal communication, May 17, 2021), which could limit communication between DNP project leader and GLA providers and, subsequently, reduce participation in DNP project implementation.	Travel to PMC and discuss DNP project implementation plan to GLA providers in person. Obtain method of communication of choice for each GLA anesthesia provider and use this method to communicate with providers.
Dexmedetomidine has recently switched to generic formula and is now more affordable (Levy, 2019), and, thus, may increase the likelihood of use at PMC.	GLA providers believe dexmedetomidine to be expensive and not worth the cost (personal communication, May 17, 2021), which hinders dexmedetomidine use and provider willingness to learn about medication uses and benefits.	Discuss with PMC pharmacists to obtain cost of dexmedetomidine for both PMC and patients. Incorporate costs of dexmedetomidine into DNP project implementation.

Appendix O: Data

Figure 1.1

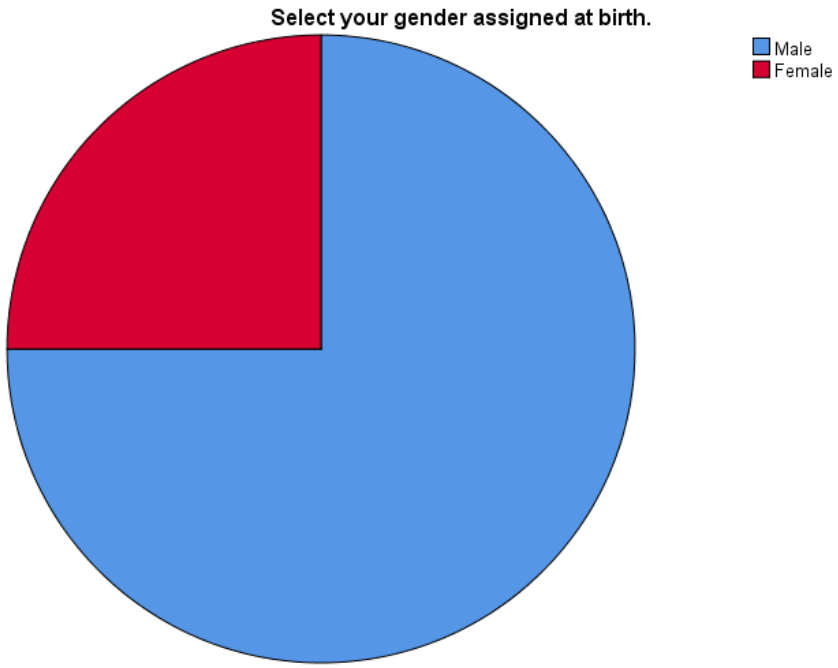


Figure 1.2

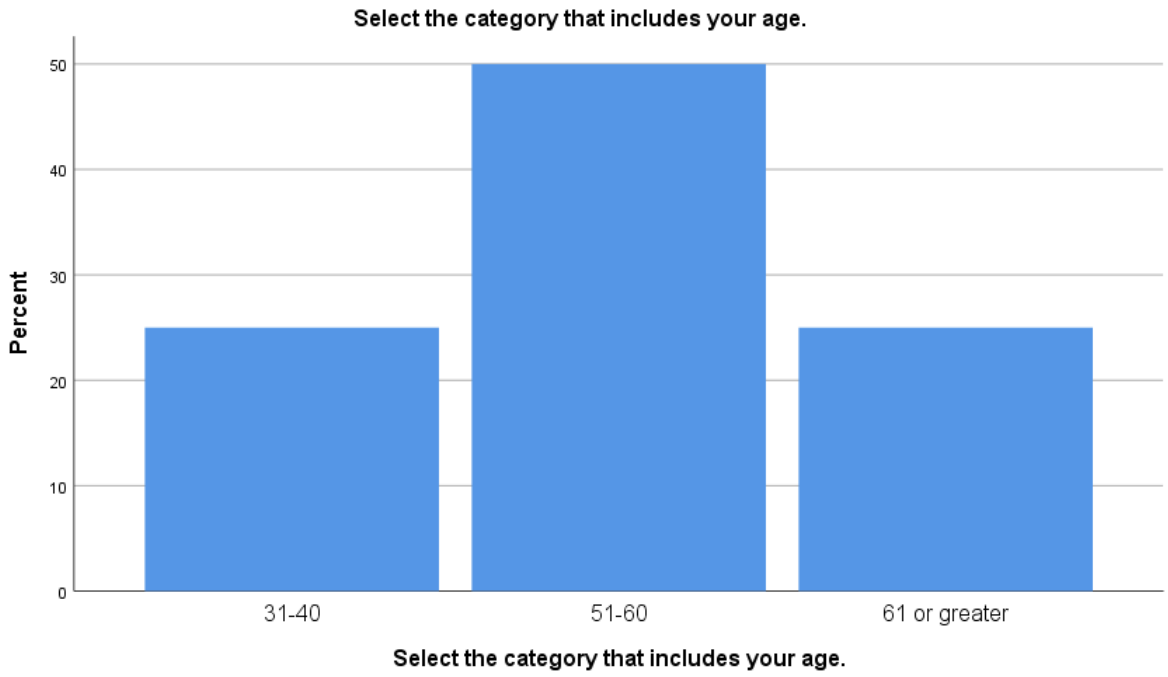


Figure 1.3

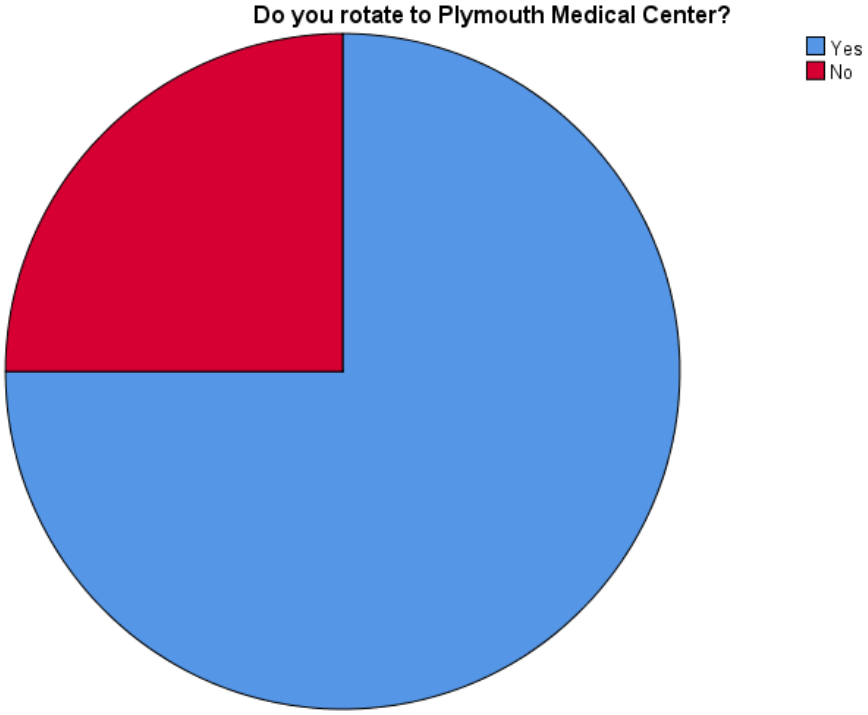


Figure 1.4