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An Objective Structured Clinical Examination (OSCE) for Adductor Canal Block (ACB) and Interspace Between the Popliteal Artery and Capsule of the Knee (iPACK) Block

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AN OBJECTIVE STRUCTURED CLINICAL EXAMINATION (OSCE) FOR ADDUCTOR CANAL BLOCK (ACB) AND INTERSPACE BETWEEN THE POPLITEAL ARTERY AND CAPSULE OF THE KNEE (IPACK) BLOCK

by

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ABSTRACT

Ultrasound-guided regional anesthesia techniques are valuable tools for anesthesia providers to learn and implement in their practice. Two specific blocks that student registered nurse anesthetists (SRNAs) need to utilize are the Adductor Canal Block (ACB) and the Interspace between the Popliteal Artery and Capsule of the Knee (iPACK) for total knee arthroscopy (TKA). Teaching these blocks to SRNAs in the clinical setting may be difficult as they will be under higher pressure to perform since they will be practicing on live patients. Understanding this stress led to a review of current Nurse Anesthesia Program (NAP) curriculum at The University of Southern Mississippi (USM) and found a gap in the education, which an Observed Structured Clinical Examination (OSCE) for the ACB and iPACK block would fill.

Since an OSCE would take place in a simulated clinical setting instead of a real clinical setting it would allow for a more controlled environment with a more standardized evaluation of the SRNA. Development of the OSCE was completed utilizing the current EBP. Upon completion, the OSCE was sent to five current USM NAP faculty, nineteen 2nd Year SRNAs, and twenty 3rd Year SRNAs for review. Of the 44 potential participants emailed, 27 participated in the survey. The majority of participants agreed that this OSCE would aid in the teaching of ACB and iPACK block for TKA.

ACKNOWLEDGMENTS

We would like to express the utmost gratitude to our committee chair, Dr. Michong Rayborn, for her unwavering support, kindness, and technical expertise. Without Dr. Rayborn's guidance, this doctoral project would never have been possible. We also want to acknowledge our committee member, Dr. Nina McLain, for her support and feedback on our doctoral project. Finally, we would like to express our appreciation towards our expert and stakeholder survey participants for their responses. Without our participants' responses, this doctoral project would not have been possible.

DEDICATION

Michael

I would like to dedicate this doctoral project to those who chose to invest their time and energy in myself and my education. Moreover, I want to specifically mention Dr. Joe "The Show" Sudderth, who took his time and energy to help start me on my anesthetic foundation. I would also like to thank my family for putting up with 37 years of my nonsense, as well as Jake Penick for dragging me across the finish line.

Jake

I would like to dedicate this doctoral project to all of my family and friends who have given me an outrageous amount of support, guidance, and good times over the years. I am not sure that I would have had the determination and gall to even attempt a program like the one I am in today without their backing. One person that I need to specifically mention is my wonderful mother, Dana, who has always supported me no matter what idiotic things I said or did. Even now when I make a mistake or do something stupid, I can hear my mom say, "Now Jake." Finally, I have to thank my doctoral project partner, Mike, for being as off the wall and insane as myself; otherwise, I do not think we would have been able to drag each other through the long nights of putting this doctoral project together. God bless and Godspeed to all of you.

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LIST OF ABBREVIATIONS

AACN	American Association of Colleges of Nursing
AANA	American Association of Nurse Anesthetists
ACB	Adductor Canal Block
ALM	Adductor Longus Muscle
BSN	Bachelor of Science in Nursing
CPN	Common Peroneal Nerve
CRNA	Certified Registered Nurse Anesthetist
DNP	Doctor of Nursing Practice
EBP	Evidence-Based Practice
FNB	Femoral Nerve Block
iPACK	Interspace between the Popliteal Artery and the Capsule of the Knee
LA	Local Anesthetic
NAP	Nurse Anesthesia Program
OSCE	Objective Structured Clinical Examination
PNB	Peripheral Nerve Block
RN	Registered Nurse
SaM	Sartorius Muscle
SaN	Saphenous Nerve
SRNA	Student Registered Nurse Anesthetist
TKA	Total Knee Arthroplasty
TN	Tibial Nerve

USM	The University of Southern Mississippi
VMM	Vastus Medialis Muscle

CHAPTER I – INTRODUCTION AND BACKGROUND

The ability to perform to the highest standards possible is the ultimate goal of anyone providing high-quality healthcare to patients. The University of Southern Mississippi's (USM) Nurse Anesthesia Program (NAP) instills this mindset in all anesthesia providers that it graduates. This means ensuring that all of USM's student registered nurse anesthetists (SRNAs) have the highest quality education. One teaching tool that the NAP is using to achieve this is the Objective Structured Clinical Examination (OSCE) tool developed in the 1970s (Nulty et al., 2011).

A review of current OSCEs revealed a gap in covered topics for adductor canal blocks (ACB) and the interspace between the popliteal artery and the knee capsule (iPACK) blocks. This doctoral project aimed to create an OSCE for ACB and iPACK blocks. The introduction of this OSCE will improve the students' preclinical training and understanding of these regional blocks.

Problem Statement

Regional anesthesia, also known as regional blocks or blocks, is a highly technical skill taught to all anesthesia providers to relieve localized areas of pain. These regional anesthetic techniques are used to manage postoperative pain, which is critical to the successful rehabilitation of orthopedic surgeries (Prasad, 2020). Therefore, teaching regional anesthesia to SRNAs is crucial.

Current issues exist with total knee arthroplasty (TKA) blocks, such as the femoral nerve block (FNB) due to its use causing residual quadriceps muscle weakness and paresthesia leading to falls (Prasad, 2020). Newly developed blocks avoid the shortcomings of the FNB, while still providing the same level of analgesia. This study

addressed two regional blocks: the ACB and iPACK blocks. The benefits of ACB and iPACK blocks, when used in tandem, provide equivalent analgesia performance to the FNB, decreased hospital length of stay, and improve physical therapy performance (Thobhani et al., 2017).

Helwani et al. (2012) discussed the importance of adequately teaching regional blocks, and that using an ultrasound technique is primarily to increase block effectiveness and safety. Teaching the ACB and iPACK blocks correctly is imperative to current anesthesia students. Since ACB and iPACK blocks are increasingly becoming the go-to blocks for managing postoperative pain in TKAs, students need to be introduced to these blocks before the clinical setting.

Issues arise, such as inaccurate block placement and difficulty visualizing structures with ultrasonography when teaching these blocks to anesthesia students because they are often not instructed or critiqued on these techniques until the day of placement. The incredible amount of pressure students experience when placing these blocks can be lessened by introducing them to ACB and iPACK blocks via an OSCE. This doctoral project provides the needed OSCE to aid SRNAs in evaluating their ability to perform ACB and iPACK blocks for TKAs, which will aid in their learning of these regional blocks.

Purpose and Context

The purpose of this OSCE was to provide a resource for teaching and evaluating SRNAs, in proficiently implementing ACB and iPACK blocks while using ultrasound guidance for patients undergoing TKA. This means it is necessary to create the means to teach and test the SRNAs' technique. The creation of this simulation-based testing and

evaluation tool will be invaluable in improving USM's NAP students' pre-clinical preparation and familiarization with ACB and iPACK blocks.

Since ACB and iPACK blocks require a basis of knowledge and hands-on skill, an OSCE will be the best way to teach and evaluate the SRNA's ability. Moreover, OSCEs allow the examination of one's ability to take the knowledge they should have, apply it to a patient scenario, and show the examiner their ability to apply knowledge to ever-evolving situations (Hastie et al., 2014). This OSCE will also allow students to be judged more objectively due to the standardized evaluation tool (Hastie et al., 2014).

Available Knowledge

SRNA Defined

Student registered nurse anesthetists (SRNA) are registered nurses (RN) who are enrolled in a graduate-level program designed to prepare someone to be a certified registered nurse anesthetist (CRNA). Before an RN can become an SRNA, they must hold a Bachelor of Science in Nursing (BSN) degree and acquire at least one year of critical care experience. The average SRNA currently in training has four and a half years of patient care experience as an RN (American Association of Nurse Anesthesiology [AANA], 2022).

Completing a nurse anesthesia program (NAP) requires intense dedication from the SRNA throughout the entire three-year program. This dedication involves high levels of didactic preparation in the classroom, hands-on familiarization in the simulation lab, and clinical aptitude when managing patients' anesthesia care. To meet these requirements, the SRNA utilizes various learning strategies when equating the lessons

learned in lectures to the practical skills that are necessary to perform anesthesia in the clinical setting.

OSCE Defined

Normally, clinical skills are evaluated in a clinical setting by the subjective opinion of knowledgeable preceptors with anesthesia experience. Clinical observations are also very limited in scope due to the lack of control variables in a clinical situation; thus, the observer is only able to see how the student performs to that day's specific needs. These evaluations have no formality or structure in how they are completed.

While lectures are the backbone of medical training, OSCEs have gained widespread acceptance since their introduction in the 1970s (Nulty et al., 2011). OSCEs allow for both formality and structure so that students are taught and evaluated on a standardized grading scale. OSCEs use standardized training, open-ended questions, close-ended questions, and scenarios with standardized patients so that students have an equal chance to demonstrate their competency (Hastie et al., 2014). These standardized simulations provide SRNAs unbiased feedback so they can better master the skills being evaluated.

Achieving mastery through OSCEs can be a one or two-part process. Depending on the needs of the program or situation, faculty can choose either formative, summative, or a combination of both types of OSCEs (Hastie et at., 2014). The first option or part is a formative OSCE designed to critique the student's mastery of a given subject, skill, or situation. During or immediately following a formative OSCE, the evaluator can provide feedback on what the student did right, what they did wrong, and how to improve (Ballister, 2018). This provides a relatively low-risk environment so the student can focus

on the task instead of the pressure of passing. Formative OSCEs are therefore used more as a teaching tool rather than a pass/fail grading system.

Summative OSCEs present the same situations as formative OSCEs but are meant to grade the student in a pass/fail system (Ballister, 2018). While feedback is still given to the student, the goal of a summative OSCE is to grade the student's competency in specific scenarios. If a combination of summative and formative OSCEs are given to a student, then the summative OSCE should only be given after the student has finished completing and reviewing their formative OSCE.

Peripheral Nerve Blocks

Peripheral nerve blocks (PNB) provide analgesia by inhibiting nociceptive signals that originate from sensory nerves located outside of the spinal cord. To perform a peripheral nerve block, the anesthesia provider injects a local anesthetic (LA) into a tissue space that contains a nerve. LAs prevent membrane depolarization by reversibly binding to intracellular voltage-gated sodium channels, which inhibits the rapid influx of sodium ions into the neuronal cell. This inhibition of sodium ion movement forces the membrane potential to remain polarized and therefore unable to transmit an action potential (Lopez et al., 2022). The desired effect is a lack of sensation caused by the disruption of the electrical impulse transmission. A few of the benefits of PNBs include a decrease in postoperative pain, nausea, and vomiting as well as shorter hospital stays (Nagelhout & Elisha, 2018).

Ultrasound-Guided Technique

Regional anesthesia using an ultrasound device has become a common method of administering LA. Traditional techniques include using anatomical landmarks and

electrical nerve stimulation. Ultrasound guidance is a non-invasive technique that allows for real-time visualization of relevant anatomic structures using high-frequency soundwaves (Lopez et al., 2022).

The equipment needed for an ultrasound-guided approach includes a handheld probe that emits ultrasonic sound waves into the target tissue, software that interprets the information received by the probe, and a monitor that displays an image created by the software. The anesthesia providers choose which specific block is appropriate for the surgical procedure, locate the target nerve, and visualize the correct path the needle must travel to deposit the local anesthetic in the optimal location. In addition to choosing the best location for LA injection, this technique aids in avoiding critical structures such as veins and arteries (Nagelhout & Elisha, 2018).

Total Knee Arthroplasty

Total Knee Arthroplasty (TKA) is a procedure where surgeons expose the femur, patella, and tibia so that cartilage and bone may be removed (Jaffe et al., 2020). Surgeons will then fit new components, typically made of plastic and metal, into the joint and secure the components using bone cement or other methods (Jaffe et al., 2020). Other methods and components are being constantly developed for this procedure due to it increasingly becoming one of the most prevalent surgeries performed (Kapoor et al., 2018).

Femoral Nerve Block

The Femoral Nerve Block (FNB) is the current gold standard for TKA blocks and is performed around the world on patients undergoing TKA (Kapoor et al., 2018). FNBs inhibit pain transmission by blocking the femoral nerve in the proximal part of the thigh

(Lopez et al., 2022). This occurs when an anesthesia provider injects LA around the femoral nerve to bathe the nerve so that analgesia is achieved (Lopez et al., 2022).

While this block is the most powerful treatment option for postoperative knee pain, it also causes quadriceps weakness in patients (Lopez et al., 2022). Upon testing quadriceps weakness amongst different regional blocks for TKA, Jæger et al.'s (2013) research showed that FNBs, when compared to ACBs, perform worse in almost all mobilization tests they tested. The findings that Jæger et al., as well as many others, continue to discover are leading to different approaches in performing TKA regional blocks.

Adductor Canal Block

Adductor Canal Block (ACB) is a recently developed block that is placed near the midthigh in between the adductor longus muscle (ALM), sartorius muscle (SaM), and vastus medialis muscle (VMM) (Lopez et al., 2022). The ALM, SaM, and VMM create a triangular channel, the adductor canal, which contains the femoral artery, femoral vein, and the saphenous nerve (SaN) (Lopez et al., 2022). This triangular shape allows easy ultrasound identification of the SaN making this an ideal block for beginners and experts alike.

ACBs require only 10 to 15 milliliters (mL) of LA to complete the block, which will bathe the SaN in LA (Lopez et al., 2022). The adductor canal where the SaN is located aids in containing the LA, thus improving the visualization of the SaN when the LA is appropriately placed (Lopez et al., 2022). Providers place the LA under ultrasound by locating the applicable muscles and inserting a needle in-plane in an anterolateral to posteromedial manner until it rests next to the SaN in the adductor canal (Lopez et al.,

2022). Anesthesia providers next aspirate to ensure no vessels have been penetrated, then proceeded to inject 1 to 2 mL of LA so that correct identification is possible, and finally inject 10 to 15 mL of LA to complete the block (Lopez et al., 2022).

iPACK Block

The injection of local anesthetic into the interspace between the popliteal artery and the knee capsule (iPACK) is an anesthetic technique for blocking pain signals from certain parts of the knee (Lopez et al., 2022). This novel technique's purpose is to provide analgesia to the posterior portion of the knee by blocking only the terminal sciatic nerve branches (Thobhani et al., 2017). Motor branches of the common peroneal nerve (CPN) and tibial nerve (TN) are spared and, as a result, motor function in the lower leg is spared. This motor-sparing technique has been shown to be effective at providing postoperative analgesia when used in conjunction with an ACB for procedures involving the knee (Mou et al., 2021).

Procedures, such as TKA, often result in significant postoperative pain for the patient and require extensive rehabilitation (Ochroch et al., 2020). Patients undergoing a TKA may benefit from an iPACK due to the reduced opioid requirements in the postoperative period, reduced muscle weakness, and earlier ambulation (Caballero-Lozada et al., 2020). It cannot be understated how important this is, especially when used in tandem with the ACB block.

Anesthesia providers perform iPACK blocks by inserting a needle into the space posterior to the femur, anterior to the popliteal artery, and proximal to the femoral condyles (Ochroch et al., 2020). After confirming the correct needle placement with the ultrasound, 15-20 mL of a long-acting local anesthetic is injected into the target tissue

(Lopez et al., 2022). If the spread of the medication is optimal, the LA exerts its effects only on the terminal sensory nerve fibers while avoiding the TN and CPN. The desired outcome is adequate posterior knee analgesia without the associated motor blockade or quadriceps weakness (Chan et al., 2021).

Patient Outcomes

Combining ACBs with iPACK blocks provides a much better pain management option for patients while also providing a smoother transition into rehabilitation. Beyond pain management, these blocks also decrease the number of time patients spends inpatient at the hospital (Kapoor et al., 2018). The decrease in length of stay results from the decrease in falls when patients receive ACB with iPACK blocks as compared to FNB (Kapoor et al., 2018).

Rationale

The current trend in anesthesia for managing postoperative pain is a multimodal approach that combines regional anesthesia techniques with non-opioid medications that act synergistically to relieve pain (Prasad, 2020). The purpose of this approach is to improve patient outcomes and decrease recovery time. This is achieved by decreasing the total amount of opioids administered, facilitating earlier rehabilitation, and avoiding the adverse effects associated with traditional pain-relieving methods (Feldheiser et al., 2015).

Regional anesthesia is a new concept to the nurse anesthesia student and the availability of multiple educational resources may be beneficial in enhancing the learning process. Comprehensive knowledge of pharmacology, anatomy, and pathophysiology is crucial to safely and effectively administer regional anesthesia. The OSCE format was

chosen because it introduces the student to an unfamiliar topic and provides an opportunity to build upon pre-existing knowledge in a non-clinical setting.

Specific Aims

As future anesthesia providers, SRNAs must become proficient with the numerous regional techniques that are continuously being developed and adopted. This OSCE serves as a supplemental training resource for SRNAs who will encounter the ACB and iPACK block in the classroom and clinical setting. The specific aim of this doctoral project was to aid in teaching the ACB and iPACK blocks to the SRNAs in the USM NAP by providing an evaluation and feedback tool. This tool will help the SRNA perform these two regional block techniques.

DNP Essentials

The American Association of Colleges of Nursing (AACN, 2006) defines the Doctor of Nursing Practice (DNP) Essentials as eight core principles that DNP programs must focus on, and that students in those programs must adhere to and be competent in. These eight DNP Essentials are guiding principles that ensure graduates maintain the highest level of professionalism and clinical know-how. While all DNP Essentials were met in this OSCE, the most exhaustively met Essentials were I and VI.

Essential I

Essential I is the Scientific Underpinnings for Practice (AACN, 2006). This means not only having the advanced knowledge required but the ability to implement it into one's practice. This OSCE met Essential I by incorporating scientific literature in its creation.

Essential VI

Essential VI is the Interprofessional Collaboration for Improving Patient and Population Health Outcomes (AACN, 2006). While knowledge is important, without strong teamwork and dedicated healthcare professionals could not learn from and improve upon each other's work. This Essential was met by using the input from both the faculty and students to guide and refine the OSCE so that better patient outcomes can be achieved.

Summary

This OSCE is a valuable tool that needs to be implemented in the program to refine USM's NAP students' ability to perform the ACB and iPACK blocks. OSCEs provide the most intuitive route for teaching these hands-on skills that are becoming more and more popular for TKA. Using an OSCE allows the students to become as proficient as possible before performing ACB and iPACK blocks in the clinical setting.

Not only can this OSCE help teach NAP students how to do these blocks, but it will give the instructors a more objective means to critique and grade the students. Since there is an evaluation component to this OSCE, instructors will have an objective set of marks that the student must check off before the instructor can pass them. This also allows the students to know exactly what they must do to succeed in learning these skills.

CHAPTER II – METHODOLOGY

Context

This DNP doctoral project met the requirements set forth by the American Association for Colleges of Nursing (AACN) DNP Essentials. Requirements from USM's College of Nursing and Health Professions were also met by this doctoral project. The ACB and iPACK blocks are fairly new procedures so there is a knowledge gap between them in the curriculum for USM NAP students. Development of this OSCE will help teach and evaluate SRNAs' ability to perform these blocks. The goal is also to boost confidence and comfort level in the SRNAs before having to place these blocks in the clinical setting.

Interventions

The intervention was the development of this OSCE for ACB and iPACK blocks using an ultrasound technique by using an OSCE, assessment rubric, and an evaluation tool for the students and NAP instructors. These items related to our intervention were all sent out via email to a panel of experts who were NAP faculty, 2nd, and 3rd year NAP students. This OSCE's creation was based on evidence-based practice (EBP) guidelines.

First, a thorough literature review was conducted on both regional block techniques. The next step was to consult the committee chair and committee member for on any alterations needed to the doctoral project. Following the committee's approval, the Institutional Review Board (IRB) was consulted for approval. After the IRB's approval (Protocol #22-757), emails were sent to USM's NAP faculty, 2nd, and 3rd year students that contained all relevant material to this OSCE. Since the SRNAs and NAP faculty were stakeholders, the evaluations were pertinent to their curriculum and learning process

of nerve-blocking techniques. With the return of the surveys, the interventions were evaluated and revisions were taken into consideration.

Measures and Instruments Used to Study the Intervention

To measure the impact and effectiveness of this doctoral project, a step-by-step methodology was used. This process included six steps to ensure precision. The methodology included the following steps:

1. Development of the OSCE template and rubric
2. Development of the survey and questionnaire
3. Development of the survey recruitment email
4. Completion of the online consent form
5. Completion of the IRB process and submission to IRB
6. After IRB approval, using *Qualtrics*®, the questionnaire and supporting materials were sent to publicly available email addresses for completion

Instruments and processes that were used within this OSCE are located in Appendix C. These instruments followed the latest evidence-based research for what to use and how to use it. Lopez et al. (2022) specify the tools and procedures for properly ACB and iPACK block equipment and placement located in Appendix C.

Analysis

Feedback for the doctoral project was acquired from faculty-approved online surveys sent to NAP instructors and USM SRNAs from the 2022 and 2023 cohorts. Invitations to participate were sent via the university email system. The surveys included several questions that helped determine the effectiveness of this OSCE as a supplemental learning device. Participants evaluated the written material as well as the instructional

video. For each question on the survey, the participants were asked whether they agree, disagree, or are neutral. There was also a quality improvement section on the form that allowed the participants to provide additional feedback if they so choose.

The qualitative and quantitative data received from the surveys were gathered and analyzed to decide if additional modifications to the OSCE are necessary. The "Agree, Disagree, or Neutral" answers had a numerical value attached to them and a score of less than 80% would have warranted possible changes based on NAP instructor guidance. The quality improvement section helped identify teaching inadequacies and address potential issues with the OSCE. Survey findings were shared with the doctoral project committee and during DNP Scholarship Day presentations to ensure all requirements of this doctoral project are met.

Ethical Considerations

Participation in the feedback process was entirely voluntary and a statement of consent was incorporated into the survey. If the participant did not consent to be surveyed, their replies were not evaluated. Since surveys were submitted anonymously, it allowed for honest critiques and constructive criticisms. Any demonstration of an anesthetic technique or familiarization with associated equipment took place in the designated simulation rooms. Neither the OSCE activity nor the feedback process was conducted in an actual clinical setting and at no point was there an interaction with live patients.

Summary

The primary goal of this doctoral project was to create an educational tool that future SRNAs could use to learn and refine the ACB and iPACK block in a controlled

setting. A secondary goal was to encourage future anesthesia providers to incorporate ultrasound guidance when administering nerve blocks. These topics were chosen specifically to demonstrate how regional anesthesia using advanced placement techniques plays an important role in providing effective anesthesia while improving patient safety.

The NAP faculty evaluated the end product before proceeding. Feedback from the surveys was incorporated into the doctoral project before uploading to the Aguila database. The dissemination of all findings, considerations, and the OSCE template has been included within the OSCE before the publication of this doctoral project. Dissemination of this doctoral project was to all NAP faculty, 2nd, and 3rd year NAP students.

CHAPTER III – RESULTS

Participants in this doctoral project were invited to provide feedback on the educational value of this OSCE. Twenty-seven participants completed the survey, four of which were expert panelists (Figure 1). The survey asked participants if they consented to participate, what position best described them, if the OSCE was beneficial to understanding/performing these blocks, whether the information was presented clearly if participants believed SRNAs would be able to identify relevant landmarks, should SRNAs know what supplies are needed, and if the OSCE included all necessary information for the SRNA to be clinically prepared to perform these blocks.

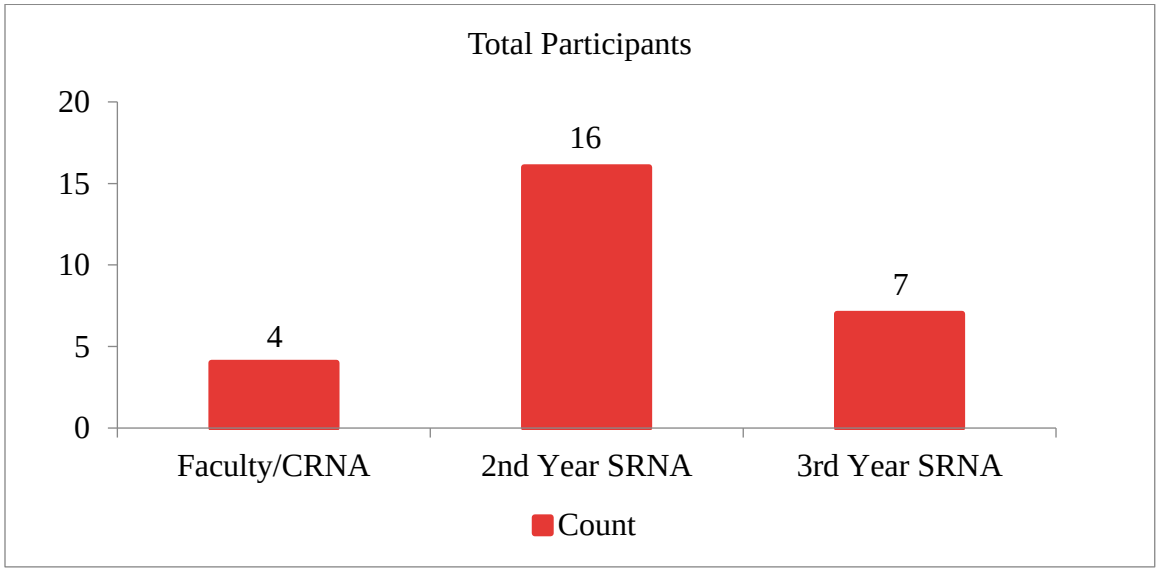

Figure 1. Survey Participants

The survey was provided via an email link that contained the OSCE and both videos of the blocks being performed. Of the 44 potential participants, 27 participated and completed the attached survey. A breakdown of the participants showed that four CRNAs, seven 3rd Year SRNAs, and sixteen 2nd Year SRNAs completed the survey, as shown above in Figure 1.

Feedback

The survey indicated that all 27 participants agreed that the OSCE would benefit SRNAs' understanding and performance of these blocks. Moreover, all participants agreed that after completing the OSCE, an SRNA should know what supplies are needed for these blocks. For all remaining questions, 26 of the 27 participants agreed, with only one participant having a neutral opinion regarding the associated statement.

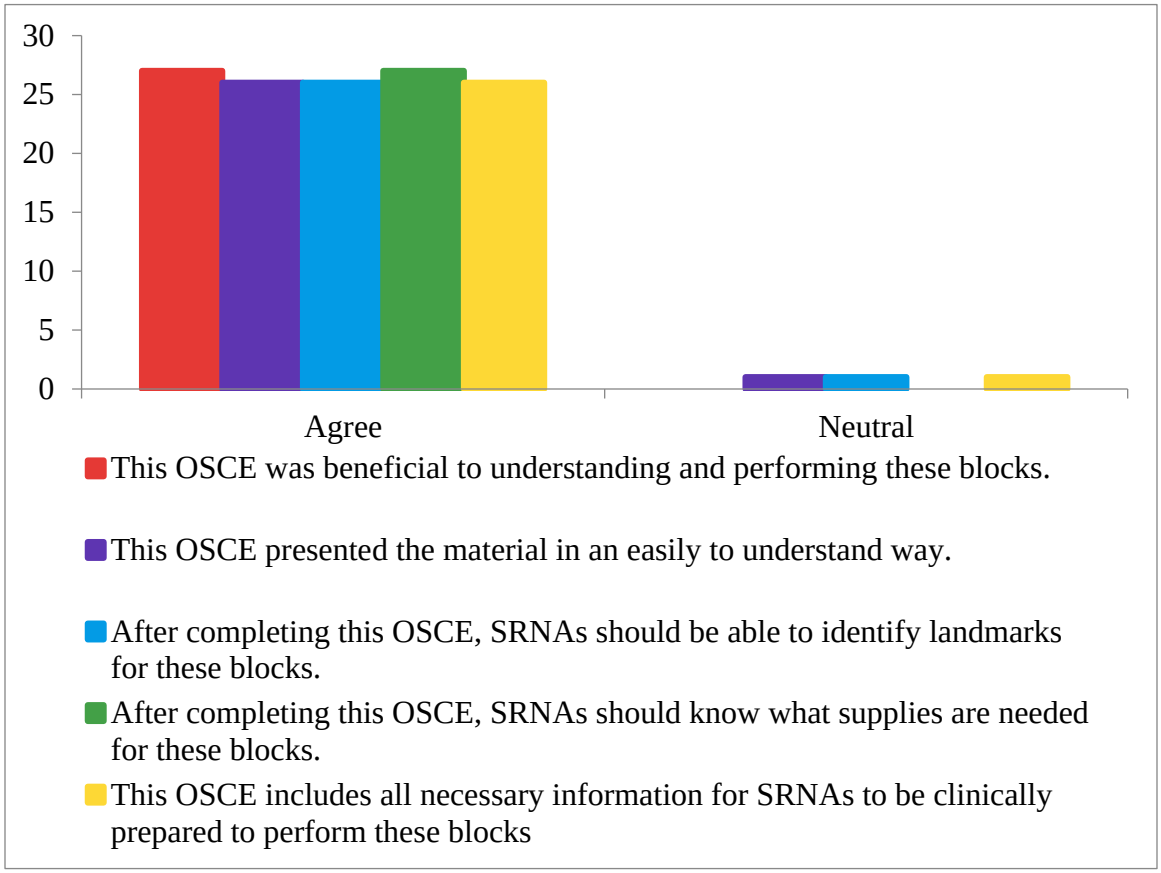

Figure 2. Post-Educational OSCE Questionnaire Responses

A textbox was included at the bottom of the survey so participants could provide comments that the questionnaire did not specifically cover. Six comments were provided, with five being positive. Only one comment provided criticism by suggesting that labeled

sonographic imagery of the block placement area should be placed within the OSCE template.

Table 1

Comments from Participants

Q4 - Please provide any feedback via the textbox below.	
SRNA	"Detailed video. Well done."
SRNA	"Excellent and very detailed work!"
CRNA	"Although the videos did a good job of demonstrating the blocks, still images contained within the OSCE template with landmarks highly identified would add a better level of comfort to practicing the blocks. If they were present I would've answered and agreed to all questions. Great job!"
CRNA	"Great video presentations!"
SRNA	"Excellent job!"
SRNA	"Quality information, this would have been awesome to have when I was learning these skills. Great work!"

Summary

This OSCE was developed to provide a high-quality educational resource to help SRNAs learn ACB and iPACK blocks. After development, the OSCE and survey were sent to Faculty/CRNAs, 3rd Year SNRAs, and 2nd Year SRNAs in USM's NAP. The survey results were positive and point to this OSCE being a high-quality educational tool in teaching SNRAs how to perform ACB and iPACK blocks for TKA. While there was one comment that suggested edits to the OSCE template there were no changes made since all other participants agreed that the OSCE was excellent.

CHAPTER IV – DISCUSSION

Anesthesia providers must provide the best possible care to patients and that includes effective analgesia. For TKAs, that means knowing how to implement ACB and iPACK blocks; however, there did not exist a dedicated OSCE for this in USM's repertoire. This doctoral project's goal was to develop an OSCE, utilizing EBP, to fill that educational gap. With the educational gap closed, SRNAs in USM's NAP could quickly learn and implement these skills effectively. The completed OSCE will be submitted for review to USM's NAP faculty so that it might be incorporated into the program as a teaching tool.

Limitations

Even though the survey results were positive, the primary limitation of this doctoral project was its small survey size. This OSCE and survey were only disseminated within USM's NAP. The survey was only sent to nurse anesthesia providers and students, which left out anesthesiologists and anesthesia assistants.

Considerations

One consideration for future study would be expanding the survey pool to different CRNA schools or even anesthesia residency programs. This expansion of the survey pool would allow for further evaluation of the OSCE's effectiveness and adaptability. Moreover, it could bring in additional suggestions for improvement. Another consideration is that this OSCE must continually be updated as new research is published.

Summary

The doctoral project's OSCE was produced utilizing the current EBP. Creating this tool will allow SRNAs to learn and implement these blocks for TKA. While survey engagement was limited, there was sufficient data to conclude that this OSCE is ready to be implemented in USM's NAP curriculum.

Conclusion

Adaptation of this doctoral project into USM's NAP curriculum would aid in teaching ACB and iPACK blocks to SRNAs. Furthermore, the OSCE could be useful to those anesthesia students beyond USM's campus. This OSCE would not just be limited to SRNAs, but instead be available to all those in the anesthesia field. Residency programs, anesthesia assistant programs, and aesthesia technicians could all possibly benefit from having this OSCE as a teaching tool.

In conclusion, the creation of this OSCE and the survey of its ability to teach ACB and iPACK blocks will reenforce what USM's SRNAs learn in their classes. It will also hopefully put those students at ease when performing these blocks on actual patients. The USM NAP will be adding the video portion of this OSCE to its phone application so that students can enjoy easy access to this information.

APPENDIX A – DNP Essentials

DNP Essentials	Clinical Implications
Essential I: Scientific Underpinning for Practice	Identified a need for an OSCE-based learning experience for ACB and iPACK blocks for clinical competency.
Essential II: Organizational and Systems Leadership for Quality	Collaboration with USM's NAP faculty and students as well as IRB approval made the development of this OSCE possible.
Essential III: Clinical Scholarship and Analytical Methods for Evidence-Based Practice	A thorough review of the current literature was conducted to determine the best practice for competency in the areas this OSCE covers.
Essential IV: Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Health Care	Implementing ACB and iPACK blocks via the utilization of ultrasound-guided techniques is covered in this doctoral project.
Essential V: Health Care Policy for Advocacy in Health Care	This doctoral project shows that this OSCE is a valuable educational tool that should be implemented in the NAP curriculum.
Essential VI: Interprofessional Collaboration for Improving Patient and Population Health Outcomes	Collaboration occurred between the authors of this doctoral project, NAP faculty, and NAP students.
Essential VII: Clinical Prevention and Population Health for Improving the Nation's Health	The goal of this doctoral project is to improve the clinical competency of future anesthesia providers, which will lead to improved patient outcomes and satisfaction.
Essential VIII: Advanced Nursing Practice	The essential is satisfied by the scientific literature review conducted as well as the techniques and knowledge taught/gained by this OSCE.

APPENDIX B – Invitation Letter

Dear Participant,

You are being invited to participate in a survey as part of a DNP project being conducted by Jake Penick and Michael Berg at The University of Southern Mississippi. If you have any questions, please reach out to Jake.Penick@usm.edu or Michael.Berg@usm.edu. The purpose of this project is to create an objective structured clinical examination (OSCE) that will improve student understanding and competence in the adductor canal and interspace between the popliteal artery and the knee (iPACK) regional blocks.

The project presents minimal or no risk of harm to you. Questions will be asked using the online survey tool *Qualtrics*®, consisting of eight questions. The survey should take less than 10 minutes to complete. All information you share is anonymous and will be kept confidential. Your data will be unidentified and anonymous.

Your participation is completely voluntary. If you choose not to participate, you can stop taking the survey and exit your browser at any time. There will be no repercussions for non-participation. An informed consent is required and included in the survey. This project and the informed consent form have been reviewed by The University of Southern Mississippi Institutional Review Board (IRB), which ensures that research projects involving human subjects follow federal regulations. This project falls under IRB protocol number [22-757]. Refer to the informed consent for participant assurance information.

If you have any questions, please contact us using the information provided below. Thanks in advance for your time and cooperation!

Michael Berg
Michael.Berg@usm.edu
(228) xxx-xxxx

Jake Penick
Jake.Penick@usm.edu
(601) xxx-xxxx

Before beginning the survey, review the attached files:

- Informed Consent
- OSCE for Adductor Canal Block (ACB) and Interspace between the Popliteal Artery and Capsule of the Knee (iPACK) Block

Video Links:

Adductor Canal Block
iPACK Block

Follow this link to the Survey:
https://usmuw.co1.qualtrics.com/jfe/form/SV_6QAjooXhgK3CEIu

APPENDIX C – OSCE Template

Objective Structured Clinical Examination for Adductor Canal Block and iPACK Block Utilizing Ultrasound Guidance for Student Nurse Anesthetists

LEARNER OUTCOMES:

1. Describe the proper use of the ultrasound machine to visualize landmarks
2. Be able to explain the difference between landmarks
3. Successfully deliver a local anesthetic to the specified nerves to achieve a block

DOMAINS: Clinical Skill, Formative Evaluation, & Performance Assessment

PURPOSE: Student practice and performance assessment

LEARNER OBJECTIVES:

1. Identify landmarks utilizing ultrasound for adductor canal block and iPACK block
2. Discuss the proper procedure for the administration of these nerve blocks
3. Appropriately deliver local anesthetic to specified nerves

INDIVIDUAL OR GROUP OSCE: Individual OSCE; One SRNA in the simulation lab at a time precepted by a more senior SRNA, that has already participated in the OSCE and has been deemed qualified by a NAP instructor to precept other SRNAs.

REQUIRED READINGS:

1. Regional Anesthesia
   Nagelhout, J. J., & Elisha, S. (2018). Regional Anesthesia. In *Nurse anesthesia* (6th ed., pp. 1042–1063). Elsevier.

2. Peripheral Nerve Blockade
   Barash, P. G., Cullen, B. F., Stoelting, R. K., Cahalan, M. K., Stock, M. C., Ortega, R. A., Sharar, S. R., Holt, N. F., Tsui, B. C. H., & Rosenquist, R. W. (2017). Peripheral Nerve Blockade In *Clinical Anesthesia* (6th ed., pp. 945–1001). Wolters Kluwer.

3. Peripheral Nerve Blocks
   Butterworth, J. F., Mackey, D. C., Wasnick, J. D., Madison, S. J., & Ilfeld, B. M. (2018). Peripheral Nerve Blocks. In *Morgan & Mikhail's Clinical Anesthesiology* (6th ed., pp. 1642–1753). McGraw Hill.

4. Subsartorial Blocks: Saphenous Nerve, Adductor Canal, and Femoral Triangle Blocks
   Lopez, A., Balocco, A. L., Vandepitte, C., & Hadzic, A. (2022). Subsartorial Blocks: Saphenous Nerve, Adductor Canal, and Femoral Triangle Blocks. In *Hadzic's peripheral nerve blocks and anatomy for ultrasound-guided regional anesthesia* (3rd ed., pp.254–264). McGraw Hill.

5. iPACK Block
   Lopez, A., Balocco, A. L., Vandepitte, C., & Hadzic, A. (2022). iPACK Block. In *Hadzic's peripheral nerve blocks and anatomy for ultrasound-guided regional anesthesia* (3rd ed., pp. 305–311). McGraw Hill.

6. REQUIRED VIDEOS:
   a. Adductor Canal Block

   b. iPACK Block

REQUIRED PARTICIPANTS: Junior Student Nurse Anesthetist (1st or 2nd Year) and Senior Student Nurse Anesthetist (3rd Year) for Formative Evaluation and Performance Assessment

VENUE: NAP Simulation Lab

STUDENT LEVEL OF OSCE: Semester 3-6

TIME ALLOTTED: 25 minutes at the station

SEQUENTIAL PRACTICE & TESTING: The lab station will be completed by performing an Adductor Canal Block and iPACK Block at the same station. This will be a peer-led OSCE to ensure there is no intimidation thus creating a learning environment in which the junior student feels at ease to ask questions.

RECOMMENDED PRACTICE PRIOR TO EXAMINATION: 3X is recommended for this station, 25 minutes each time (75 minutes total)

CONTEXT:

Adductor Canal Block & iPACK Block Scenario:

You are assigned to OR 4 today. The first patient is a professional athlete, Mr. Roberts, who is here today for a total knee arthroplasty (TKA). He was injured last week in a sports-related injury by another player. Mr. Roberts' current vitals are as follows: HR: 62bpm, BP: 118/64, RR: 14, and Pulse Ox: 100% on room air. When interviewing Mr. Roberts, you denote no significant health history, an anesthesia history of an uneventful wisdom teeth removal 6 years ago, and the only medication he is currently on is Norco 7.5mg/300mg Q6 PRN. As the CRNA for Mr. Roberts, you understand the importance of his quick recovery and elect to perform a dual ACB/iPACK block for his TKA to reduce residual quadriceps weakness.

EQUIPMENT & SUPPLIES:

- Gloves (Sterile and nonsterile)
- Antiseptic solution for skin disinfection (Chloraprep and alcohol pad)
- Gauze
- One 1-mL syringe with a 25-gauge needle for the skin wheel
- One 30-mL syringe for local anesthetic (Adductor Canal Block)
- One 30-mL syringe for local anesthetic (iPACK Block)
- One 5-8cm, 22-gauge, short-bevel, insulated stimulating needle (Adductor Canal Block)
- One 10-15cm, 20- to 22-gauge, short-bevel, insulated stimulating needle (iPACK Block)

- Choice of local anesthetic (provider's choice, dependent upon patient and procedure)
- Ultrasound machine
- High-frequency (10-15 MHz) linear transducer (Adductor Canal Block)
- Low-frequency (2-5 MHz) curvilinear transducer (iPACK Block)
- Sterile Ultrasound Transducer Sleeve
- Sterile and nonsterile ultrasound gel

SITE SELECTION:

Adductor Canal Block - This block should be performed in a supine position with the knee slightly flexed and externally rotated. Next, the ultrasound linear transducer is placed transversely over the medial section of the midthigh where the femoral artery is visualized. The SRNA must then scan the thigh in a proximal to distal manner along the sartorius muscle and femoral artery. Once the femoral artery is located directly under the sartorius muscle, the SRNA verbally note that they are viewing the adductor canal and denote the structures therein. Then the needle should be inserted in-plane going from an anterolateral to posteromedial direction until the needle is lateral to the femoral artery. The SRNA will aspirate, which should be negative, inject the LA, and retract the needle (Lopez et al., 2022. p. 259).

iPACK Block - This block is usually performed with the patient positioned supine. The operative leg should be externally rotated and flexed at the knee, resembling a "frog leg". The curvilinear transducer is placed on the posterolateral surface of the distal thigh in a transverse orientation, approximately 2-3 centimeters proximal to the knee. The student should now be able to visualize the femur, popliteal artery, and popliteal vein. Gentle

downward pressure may be applied to the transducer to view the arterial pulsations. The block needle is then inserted in-plane in a medial-to-lateral approach. The needle is advanced until the tip is approximately 2 cm distal to the lateral edge of the popliteal artery. After confirming negative aspiration, 15-20 mL of LA is injected while the needle is simultaneously being withdrawn (Lopez et al., 2022).

TASK STATEMENT:

Your task is to select the appropriate area for each block, demonstrate the use of the ultrasound machine in finding the nerve bundles by identifying landmarks and layers and walk the preceptor through performing a peripheral nerve block using the ultrasound machine.

PROCESS

1. Identify patient, verify surgery, & obtain consent for regional anesthesia
2. Supplies- gather all supplies for a specific block
3. Perform timeout prior to beginning the procedure
4. Patient position- ensure comfort; administer sedative PRN
5. Identify site selection prior to obtaining US imaging
6. Properly utilize the US machine and correctly identify landmarks
7. Properly clean the area where the needle is to be inserted
8. Apply a skin wheal of LA to the area where the blocking needle will be inserted
9. Reclean the area
10. Apply ultrasound gel to the transducer
11. Put on sterile gloves
12. Place ultrasound transducer in a sterile probe cover

13. Use remaining sterile US gel to needle insertion site
14. Relocate the proper blocking area with the US transducer
15. Have the assistant prime the blocking needle
16. Insert the insulated stimulating needle at the appropriate angle so that the tip is the in-plane view on US imaging
17. Once the needle is in the appropriate area have your assistant negatively aspirate to ensure no vessels have been punctured
18. Deliver LA to specific nerve bundles, ensuring to aspirate the needle after delivery of incremental doses monitoring the spread of the LA *bathing* the nerve bundles
19. Monitor for signs and symptoms of Local Anesthetic Systemic Toxicity (LAST)
20. Reevaluate the effectiveness of the nerve block

DEBRIEFING FORM:

Adductor Canal Block:

1. Which is being blocked in an ACB?
    A. Saphenous Nerve (Lopez et al., 2022. p. 256)
2. What are 3 potential risks/complications to the ACB?
    A. Femoral vascular puncture/dissection, quadriceps weakness, and LAST are all complications/limitations to the ACB (Lopez et al., 2022. p. 255).
3. What is the correct approach, from an anatomical standpoint, to perform an ACB?
    A. The needle should be from an anterolateral to posteromedial direction with the ultrasound transducer placed on the medial side of the thigh (Lopez et al., 2022. p. 263).

iPACK Block:

1. The iPACK block provides adequate postoperative analgesia for what specific area?
    A. The posterior aspect of the knee (Chan et al., 2021)
2. Which motor nerves are spared with the iPACK?
    A. Tibial nerve and common peroneal nerve (Chan et al., 2021)
3. In what direction does the clinician insert the needle when administering an iPACK block?
    A. The needle should be inserted in a medial-to-lateral approach (Lopez et al., 2022)

ASSESSMENT QUESTION AND DEMONSTRATION STATION: TASKS

TASKS	PASS	FAIL
1. Performs Timeout (Identifying patient and procedure along with the informed anesthesia consent); Prepares and selects appropriate equipment		
2. Ensures patient positioning for procedure		
3. Demonstrates proper use of ultrasound machinery		
4. Identifies site selection with proper antiseptic application		
5. Identifies landmarks and structures appropriately on the image provided		
6. Demonstrates the proper angle of insertion of stimulating needle for an “in-plane” view		
7. Maintains confirmation of needle tip throughout the procedure		

8. Identifies adequate spread of LA next to nerve bundles after aspirating to ensure the needle tip is not in an artery or vein		
9. Assesses patient for signs and symptoms of LAST		
10. Appropriately cleans machinery and returns it to the original location		
11. Re-evaluates the effectiveness of the nerve block		

-OSCE performance by the student demonstrates foundational knowledge and correct use of the ultrasound machine for an adequate nerve block: (Circle one) PASS FAIL

-The student is required to repeat this OSCE at a later date to satisfy learning requirements. (Circle one) YES or NO Date to return for evaluation:_____

EXAMINER: _____ DATE: _____

ORI | Office of Research Integrity

INSTITUTIONAL REVIEW BOARD
STANDARD (ONLINE) INFORMED CONSENT

STANDARD (ONLINE) INFORMED CONSENT PROCEDURES
• ***Use of this template is optional.*** However, by federal regulations (45 CFR 46.116), all consent documentation must address each of the required elements listed below (purpose, procedures, duration, benefits, risks, alternative procedures, confidentiality, whom to contact in case of injury, and a statement that participation is voluntary). Last Edited August 13th, 2021

Today's date:04/17/2022		
PROJECT INFORMATION		
Project Title: An Objective Structured Clinical Evaluation (OSCE) for Adductor Canal Block (ACB) and Interspace between the Popliteal Artery and Capsule of the Knee (iPACK) Block		
Principal Investigator: Michael Berg Co-Principle Investigator: Jake Penick IRB Protocol Number: 22-757	Phone: 228-238-2378 or 601-572-4815	Email: michael.berg@usm.edu or jake.penick@usm.edu
College: Nursing and Health Professions	School and Program: School of Leadership and Advanced Nursing Practice	
RESEARCH DESCRIPTION		
1. **Purpose**: The purpose of this survey is to gather feedback from anesthesia providers and USM NAP faculty to determine if this project produces an effective OSCE. 2. **Description of Study:** This project will take no longer than ten minutes to complete and will require the participation of NAP faculty and at least forty current anesthesia providers. There will be no restrictions on		

normal activities and the only inconvenience will be the time required to complete the survey.

3. **Benefits:**
   There will be no benefits or incentives awarded to the participants. However, there will be benefits to the project's authors in the form of DNP project completion, which is required by USM's NAP for graduation.

4. **Risks:**
   The only potential inconvenience is the 5-10 minutes needed to complete the voluntary survery.

5. **Confidentiality:**
   Surveys will be submitted anonymously and will not ask for identifying information. All electronic files that contain data taken from the surveys will be stored on a password-protect computer and deleted upon completion of the DNP project. Any printed information will be completely shredded and disposed of on-site in the secure shred box of the College of Nursing and Health Professions work room.

6. **Alternative Procedures:**
   All invitation recipients have the right to refuse to participate in the survery. No negative repercussions will occur towards those that decline participation.

7. **Participant's Assurance:**
   This project and this consent form have been reviewed by the Institutional Review Board, which ensures that research projects involving human subjects follow federal regulations. Any questions or concerns about rights as a research participant should be directed to the Chair of the Institutional Review Board, The University of Southern Mississippi, 118 College Drive #5125, Hattiesburg, MS 39406-0001, 601-266-5997.

   Any questions about this research project should be directed to the Principal Investigator using the contact information provided above.

CONSENT TO PARTICIPATE IN RESEARCH

I understand that participation in this project is completely voluntary, and I may withdraw at any time without penalty, prejudice, or loss of benefits. Unless described above, all personal information will be kept strictly confidential, including my name and other identifying information. All procedures to be followed and their purposes were explained to me. Information was given about all benefits, risks, inconveniences, or discomforts that might be expected. Any new information that develops during the project will be provided to me if that information may affect my willingness to continue participation in the project.

(Include the following information only if applicable. Otherwise delete this entire paragraph before submitting for IRB approval:) The University of Southern Mississippi has no mechanism to provide compensation for participants who may incur injuries as a result of participation in research projects. However, efforts will be made to make available the facilities and professional skills at the University. Participants may incur charges as a result of treatment related to research injuries. Information regarding treatment or the absence of treatment has been given above.

CONSENT TO PARTICIPATE IN RESEARCH

By clicking the box below, I give my consent to participate in this research project. ***If you do not wish to participate in this study, please close your browser now.***

☐ Yes, I consent to participate.

APPENDIX E – Questionnaire Form

	Please Circle One
1. Do you consent to participation?	YES NO
2. Which option best describes you?	Faculty/CRNA 2nd Year SRNA 3rd Year SRNA
3. This OSCE was beneficial to understanding and performing these blocks.	Agree Neutral Disagree
4. This OSCE presented the material in an easy-to-understand way.	Agree Neutral Disagree
5. After completing this OSCE, SRNAs should be able to identify landmarks for these blocks.	Agree Neutral Disagree
6. After completing this OSCE, SRNAs should know what supplies are needed for these blocks.	Agree Neutral Disagree
7. This OSCE includes all the necessary information for SRNAs to be clinically prepared to perform these blocks.	Agree Neutral Disagree
8. Please provide any feedback via the text box:	

Link to *Qualtrics*® survey:

https://usmuw.co1.qualtrics.com/jfe/form/SV_6QAjooXhgK3CEIu

APPENDIX F – IRB Approval Letter

Office *of*
Research Integrity

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

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NOTICE OF INSTITUTIONAL REVIEW BOARD ACTION

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

- The risks to subjects are minimized and reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered involving risks to subjects must be reported immediately. Problems should be reported to ORI via the Incident submission on InfoEd IRB.
- The period of approval is twelve months. An application for renewal must be submitted for projects exceeding twelve months.

PROTOCOL NUMBER:	22-757
PROJECT TITLE:	An Objective Structured Clinical Evaluation (OSCE) for Adductor Canal Block (ACB) and Interspace between the Popliteal Artery and Capsule of the Knee (iPACK) Block
SCHOOL/PROGRAM	Leadership & Advanced Nursing
RESEARCHERS:	PI: Michael Berg Investigators: Berg, Michael~Penick, Jake~Rayborn, Michong~
IRB COMMITTEE ACTION:	Approved
CATEGORY:	Expedited Category
PERIOD OF APPROVAL:	22-Jun-2022 to 21-Jun-2023

Donald Sacco, Ph.D.
Institutional Review Board Chairperson

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