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AN OBJECTIVE STRUCTURED CLINICAL EXAMINATION FOR CENTRAL LINE PLACEMENT USING ULTRASOUND-GUIDED AND LANDMARK GUIDED TECHNIQUE

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by

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ABSTRACT

Central venous catheters (CVCs) are a vital part of the care and safety for critically ill patients requiring surgery. CVCs allow the anesthesia provider to administer medications that may be corrosive to smaller veins, monitor hemodynamic stability, and provide a way to swiftly treat hypovolemia and states of shock (Butterworth et al., 2018). CVCs also provide a route for access in patients with poor peripheral vasculature and a means for cardiac pacing (Butterworth et al., 2018). Placement of CVCs can be obtained through ultrasound-guided and landmark-guided methods. The major impediment of CVC placement is the lack of proper training in how to use the ultrasound and skills in using these techniques for placement.

The goal of this doctoral project was to create an objective structured clinical examination (OSCE) to aid in the education and evaluation of student registered nurse anesthetists (SRNAs) at The University of Southern Mississippi (USM) on the correct placement of ultrasound-guided and landmark-guided CVCs. The evidence-based practice provided the basis for this doctoral project. The OSCE was evaluated by a panel of USM's Nurse Anesthesia Program (NAP) faculty and fellow SRNAs. A survey was utilized to gain insight into ways to improve the OSCE to provide the most effective and accurate education tool for SRNAs.

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We would like to express our sincerest gratitude to our committee chair, Dr. Michong Rayborn. We are thankful for her constant encouragement, support, and dedication to us and our project. We would not be here without her.

DEDICATION

Morgan: Words cannot adequately describe the appreciation I have for the ones who have supported me through this journey. My education and life goals would not be possible without the wonderful support of my friends and family. A special thank you to my Mom and Dad for instilling the value of hard work in me and making my dreams a reality. I hope to make you all proud.

Hannah: I would like to thank my friends and family for their unconditional love and support. My parents, Brian and Tish, and my sister, Laura Kathryn, have been the encouraging cheerleaders I could have never deserved, and I would not be where I am today without their sacrifice and support. Thank you for everything, I love you all!

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LIST OF ABBREVIATIONS

AANA	American Association of Nurse Anesthetists
CLABSI	Central Line Associated Bloodstream Infection
CVC	Central Venous Catheter
CRNA	Certified Registered Nurse Anesthetists
CHG	Chlorhexidine Gluconate
IRB	Institutional Review Board
NAP	Nurse Anesthesia Program
OSCE	Objective Structured Clinical Examination
SRNA	Student Registered Nurse Anesthetist
USM	The University of Southern Mississippi

CHAPTER I – INTRODUCTION AND BACKGROUND

Certified registered nurse anesthetists (CRNAs) are registered nurses who worked in critical care and have completed formal training and education to perform anesthesia. Student registered nurse anesthetists (SRNAs) are required to complete over 600 cases, thousands of hours of anesthesia training, and numerous procedures to graduate. Throughout their program, SRNAs must apply knowledge from their courses and laboratory simulations to real patients at various clinical sites.

Problem Description

SRNAs and CRNAs alike are held to standards of care mandated by the American Association of Nurse Anesthetists (AANA). These standards include various aspects of patient safety, proper documentation, and equipment checks. Two of those standards of care, quality improvement and maintaining a culture of safety are essential parts of SRNA training. The AANA code of ethics demands that the CRNA "works in collaboration with the healthcare community to promote highly competent, ethical, safe, quality patient care" (AANA, 2018, p. 8). To uphold these standards, SRNAs receive adequate simulation and didactic training to confidently provide safe and quality care in a clinical setting.

As SRNAs progress through their educational program and clinical training, their ability to and expectations to perform different procedures become more rigorous. Each clinical site allows students to develop different skills and perspectives on anesthesia care. These expectations can be both an advantage and disadvantage to the student and

may lead to a failure to meet expectations. Creating a standardized tool and mechanism of learning is vital.

Simulating tasks and procedures in a controlled setting can remove anxiety and stress related to unknowns. SRNAs are under continuous scrutiny by precepting CRNAs and preparing them to perform skills is vital (Chipas et al., 2012). If a student has been exposed to and practiced a skill, they will be more ready to perform when called upon. SRNAs need simulation to gain constructive feedback and a better understanding of patient safety.

Central line placement is a vital skill for SRNAs to learn. These lines can be placed by using both anatomical landmarks and ultrasound guidance. Central lines are used in a number of settings to administer vasopressors, fluids and to monitor central venous pressure in patients who are seriously ill or undergoing invasive surgeries (Butterworth et al., 2018). If the student is not prepared in a simulation setting to perform both of these techniques, they may feel overwhelmed when asked to perform the task for the first time in clinical practice. Students must be well versed in central line placement using both techniques and understand why the line is being placed, and when to place one.

Purpose and Context

The purpose of creating this OSCE is to create a standardized tool with which a student can learn how to place central lines using both ultrasound and anatomical landmarks. Simulation allows them to confront situational stress related to performing a

new procedure and using new tools before entering a clinical setting with real patients. Implementing the OSCE will allow instructors to objectively evaluate students and provide them with constructive feedback for areas of improvement.

The students will learn to use anatomical landmarks so that they are prepared to perform this procedure in facilities or situations that do not have access to ultrasound devices. The use of ultrasound-guided techniques allows for visual confirmation of anatomy and identification of correct placement within the vein. Understanding and being competent in both landmark and ultrasound-guided techniques is imperative in providing safe and quality care and acting as an advocate for patients as warranted by the AANA code of ethics (AANA, 2018).

The OSCE can be used by SRNAs at USM as an adjunct to classroom learning and as an evaluation tool for instructors to assess SRNA's readiness. An OSCE can be used for simulation to eliminate variation in evaluating SRNA performance. SRNAs can be tested multiple times over the course, allowing the OSCE to document their progress with the skill, while scenarios increase with complexity. Checklists are often developed to allow for consistency and objectivity in using OSCEs. SRNAs currently use simulation labs with instructors, and clinical experience to train for central line placement. The OSCE can be used to decrease stress associated with clinical performance, enhance clinical skills and knowledge, and create a competent provider.

Available Knowledge

Objective Structured Clinical Examination (OSCE)

Objective structured clinical examination (OSCE) was first developed in the 1970s to assess the competence of a student's skills and training. OSCEs are used to evaluate and assess the competency of students using direct observation and evaluate the student's ability to problem-solve, teach, communicate, and interpret data. The advantages of OSCEs are their versatility, uniformity, safety, feedback, availability, customization to skill level, and reduced risk. OSCEs provide a standardized format that allows consistent evaluations, even when the simulations are overseen by more than one instructor (Zayyan, 2011).

Central Venous Catheters (CVC)

Central venous catheters (CVC) are peripherally inserted devices placed in large veins for various indications such as total parenteral nutrition (TPN), dialysis, plasmapheresis, medication administration, hemodynamic monitoring, and facilitation of transvenous pacemaker placement. Catheter placement is an essential skill for advanced practice providers. CVCs can be placed in the internal jugular vein, common femoral vein, or the subclavian vein, with the internal jugular (IJ) chosen most often (Butterworth et al, 2018). The IJ is located anterolateral to the common carotid artery. The IJ can be identified as the superior portion of an anatomical triangle created by the sternocleidomastoid and the clavicle, and accessed from 3 different approaches: anterior, central, and posterior (Butterworth et al, 2018). As previously stated, central venous

catheters are often indicated for infusions that are destructive to peripheral veins and tissue such as vasopressors, TPN, or chemotherapy. CVCs should generally be avoided in thrombocytopenic or coagulopathic patients and are contraindicated where there is active soft tissue infection, anatomical distortion or hardware, and vascular injury near the site of insertion. Potential complications during CVC placement are arrhythmias, arterial puncture, pulmonary puncture (can include resulting pneumothorax), bleeding, tracheal injury, and air emboli (Kolikof et al., 2021).

Ultrasound Guided Placement

Central venous catheter placement is traditionally done using landmark identification. However, anatomy varies from patient to patient, misleading practitioners and leaving room for error. Using ultrasound, providers can visualize appropriate structures, confirm patency of the vein and avoid puncturing an artery.

The ultrasound probe consists of high-frequency transducers that have a scanning surface of 20-50mm, allowing high-resolution imaging. The probe has an orientation marker on one side that ensures correct placement and orientation. There are two different techniques for using ultrasound to place a CVC, static or indirect and real-time or direct. The static technique involves the use of ultrasound only to identify the anatomy and vein, while the direct technique uses the ultrasound during the entirety of needle advancement and puncture to guide placement (Saugel et al., 2017).

Learning these techniques is extremely important to place central lines. According to Saugel, a meta-analysis of 35 trials with over 5100 patients showed that the use of

ultrasound instead of solely landmark technique showed a higher rate of successful placement, decrease in arterial puncture, hematoma formation, and the number of attempts (Saugel et al., 2017). In 2012, the American Society of Anesthesiologists (ASA) officially recommended the use of ultrasound in placing central lines and identifying anatomy.

Landmark Guided Placement

Landmark-guided placement of central venous catheters was the standard way of placing CVCs until ultrasound machines were utilized and are still used today. It is imperative to know how to place a central line using only landmark guidance for emergent situations or when an ultrasound is not available. When placing a central line, the internal jugular vein is the preferred site due to its decreased risk of pleural insertion, bleeding, and infection when compared to subclavian and femoral insertion (Ferrada, 2020). Placement of a central line begins with the identification of surrounding structures and the anatomical characteristics of the internal jugular vein. First, begin by identifying the carotid artery through palpation. Next, identify the sternocleidomastoid muscle and its two heads. The two heads lie above the clavicle with the sternal head being the most medial and the clavicular head lying lateral to the sternal head. The internal jugular vein normally lies anterolateral to the carotid artery and behind the sternocleidomastoid muscle. The internal jugular vein emerges between the sternal and clavicular heads at the base of the patient's neck. It is imperative that SRNAs possess a high working knowledge of anatomy for the safe placement of landmark-guided CVC.

Central Line-Associated Bloodstream Infection (CLABSI)

Central venous catheters terminate in the superior vena cava of the heart which places the patient at great risk for hazardous microbes to enter the bloodstream. A CVC placed in the femoral vein is associated with the highest risk of central line-associated bloodstream infection (CLABSI) (Ling et al., 2016). There are several routes that harmful bacteria can access central lines to cause CLABSIs such as through the hubs of the central line lumens and contaminated infusions. The most common way of acquiring CLABSIs is the entrance of the bacteria through the subcutaneous tissue until it reaches the insertion site. CLABSIs are costly to hospitals and detrimental to patients, increasing their morbidity and mortality. CLABSIs can be prevented when evidence-based protocols are utilized during insertion of the CVC as well as for maintenance after placement.

Sterile Technique

Sterile technique is the best way to prevent CLABSIs when inserting CVCs. The sterile technique begins with hand hygiene before and after palpation of the surrounding anatomical structures before insertion. A chlorhexidine skin prep should follow after the site has been chosen and palpated. After cleansing of the site, sterile draping should be placed on the patient with the insertion site exposed to maintain the "maximum barrier precautions" (Ling et al., 2016, p. 18). The anesthesia provider performing the CVC insertion should don a sterile gown, gloves, hat, and eyewear protection. A sterile dressing with chlorhexidine gluconate (CHG) impregnated biopatch disk should be applied immediately after the CVC is placed. Organizational staff should provide regular maintenance of CVC according to evidence-based practice guidelines. Proper sterile

technique is required to ensure patient safety throughout CVC insertion and maintenance after placement.

Rationale

Central line placement is a necessity in the field of anesthesia for certain patients. While not every patient requires a central line, a CVC can ensure the CRNA can provide medications swiftly and effectively. As stated above, central lines are essential when the administration of specific drugs is required, hemodynamic monitoring is needed, and for certain surgical procedures. Central lines are also necessary when peripheral intravenous access is unable to be obtained. While ultrasound guidance is becoming the gold standard in providing the safest and most efficient placement of central lines, it is also important for SRNAs to know how to efficiently place a central line using only landmark guidance. A major barrier to both methods of catheter insertion is the lack of knowledge of placement steps and inexperience using the ultrasound. Formal training for future anesthesia providers is vital to gain the skill set required to place central lines, whether it be ultrasound-guided or landmark-guided. With a step-by-step tutorial, students can learn to successfully place CVCs while maintaining patient safety and gaining confidence in the skill.

Specific Aims

The purpose of this doctoral project was to develop an OSCE to aid in the education and practice of ultrasound-guided and landmark-guided central venous catheter insertion for SRNAs. The development of this OSCE will provide clear instructions for step-by-step guidance of central lines as well as a method to evaluate students on their

ability to perform the skill in the clinical setting. Once SRNAs have practiced and completed the OSCE, students will gain confidence in their ability to perform thus relieving stress in the clinical setting.

DNP Essentials

The American Association of Colleges of Nursing (AACN) outlines eight required essentials for obtaining a Doctor of Nursing Practice (DNP) degree (2006). All eight essentials were met through the development of this OSCE with major focus placed on the utilization of Essentials I and VI.

Essential I: Scientific Underpinning for Practice

The development of this OSCE embodied Essential I by utilizing nursing science and other scientific research to create a tool for SRNA learning (AANA, 2006, p. 8).

Essential VI: Interprofessional Collaboration for Improving Patient and Population Outcomes

Essential VI was demonstrated in this project by creating an OSCE that will supplement SRNA education thus improving patient safety and care (AANA, 2006, p. 14).

Summary

The development of this OSCE will aid SRNAs in acquiring central venous catheter insertion skills as well as increase confidence in their abilities to place them. Central venous catheters are common and often necessary in sick patients that present for surgical procedures. Both ultrasound-guided and landmark-guided CVC placement techniques are important for the SRNA to master, and this OSCE will provide them with

the proper steps and a method for evaluating their knowledge and progress. Through OSCE training and objective evaluations, SRNAs will be more prepared to enter the clinical setting with the skill set necessary to place central lines using both methods thus enhancing students' confidence, relieving stress, and promoting patient safety.

CHAPTER II - METHODOLOGY

As discussed above, central lines serve a vital role in the care of critically ill patients. Both ultrasound-guided and landmark-guided placement education are of utmost importance to the SRNA. This doctoral project set out to develop an OSCE to aid in the development of central line placement skillsets for SRNAs and provide a way to evaluate SRNAs in a simulation setting before practicing the skill in the clinical setting.

Context

Current best practice procedures were selected by conducting a thorough literature review. We reviewed material detailing the benefits and drawbacks to both ultrasound-guided and landmark-guided central line placement. In the healthcare field today, ultrasound-guided placement is considered the gold standard and is highly recommended to confirm correct placement compared to landmark placement (Butterworth et al., 2018). Difficult placement can result in delayed care for critically ill patients. The development of this OSCE sought to provide education on both placement techniques and offer a way to evaluate SRNAs on their CVC placement skills to be ready to perform in the clinical setting.

Design

Steps

The project was presented and proposed to the DNP project committee members to ensure its relevance to clinical practice. Once approved by the DNP project committee, the project was submitted to the Institutional Review Board (IRB) for further approval.

Once approval was received from IRB (Protocol #22-224), the evidence-based practice was reviewed. An OSCE was developed for use by SRNA students at USM to guide and enhance the clinical simulation of ultrasound-guided and landmark-based placement of central lines in the intrajugular vein.

Participation Recruitment and Evaluation

The OSCE was developed using evidence-based practice and revised after receiving feedback from USM NAP instructors and SRNAs. After the development of the OSCE, evaluation tools were also created to gain feedback on the effectiveness of the OSCE. USM Faculty and students were recruited via email and sent a survey to provide feedback. Participation was voluntary and the participants were assured that they would remain anonymous.

Intervention

The primary goal of this project was to enhance learning for SRNAs enrolled in the NAP program at USM while alleviating a source of stress in learning new skills. The intervention was the creation of an OSCE for ultrasound-guided and landmark-based approaches to the placement of central lines. The module created contains the OSCE, a post-education feedback questionnaire, and a survey for feedback regarding the effectiveness of the OSCE.

Measures

The implementation of this OSCE will strengthen the education for the nurse anesthesia program (NAP) at USM. Evaluations completed will provide feedback to enhance the OSCE to better prepare the SRNAs for clinical practice. Patient satisfaction will be boosted through improved clinical practice of SRNAs.

Data Collection and Analysis

A survey was utilized to gain qualitative data for the development and assessment of this OSCE. The template, supporting materials, and survey were sent via email to the students and faculty. The survey contained information regarding the content, steps, and clarity of the OSCE and was created using Qualtrics™ (Appendix C). The survey discussed the following questions: (1) participation consent, (2) whether the participant was an SRNA or CRNA, (3) was the OSCE beneficial in providing clear instructions of central venous catheter insertion, (4) after completing the OSCE was the ability to identify the landmarks of the internal jugular vein easier, (5) did the OSCE include all the necessary information to help SRNAs be successful in CVC placement, (6) was the length of the OSCE appropriate, and (7) any comments or suggestions to improve the OSCE for SRNA central line placement success. NAP instructors and fellow SRNAs provided feedback which was used to enhance the OSCE. We reviewed the data collected from the evaluations and worked to analyze the data given to make improvements to the OSCE.

Ethical Considerations

Patient safety was at the center of the development of this OSCE. By implementing standardized evaluation and guidelines, the SRNAs enrolled at USM will have clear and concise instructions for placement of central lines, assuring that sterile technique is implemented and maintained, and performance in the clinical setting. The OSCE was developed without the use of direct patient contact and participants in the survey were kept anonymous and voluntary.

Summary

The purpose of developing this OSCE is to reduce stress related to new clinical skills, improve patient safety, and strengthen the curriculum in the NAP program at USM. Evidence-based practice was gathered and reviewed to develop the OSCE after IRB approval. The OSCE was developed with best practice guidelines at the forefront of its design, and feedback was received from a panel of participants including SRNAs and NAP faculty. Adjustments were made based upon survey results, and the completed OSCE was presented to NAP faculty to implement in their curriculum.

CHAPTER III - RESULTS

Results were collected after sending invitations to prospective participants via email. Sixty-one participation requests were sent with a total of four NAP faculty and thirty-nine students completing the survey and evaluating the OSCE. The results from the forty-three responses are shown below in Tables 1 and 2. Table 1, below, shows the results of the demographics of the participants. Analysis of the questions was conducted and found that one hundred percent of participants thought the OSCE was beneficial, presented clear and exact instructions, and decreased stress-related to performing a new procedure. Recommended changes included: slowing down the introduction and static shots of the video, including a list of supplies when presenting the central line placement kit, identifying how far to place the guidewire and dilator, identifying if a filter needle was used for lidocaine, and if the central line should be sutured into place after insertion. Seven of the forty-three participants thought that the length of the OSCE was too long. Table 2 shows the suggestions for changes and other feedback. Upon reviewing the feedback, we made the recommended changes which included slowing the introduction and static shots timing down, including the list of supplies with the labeled central line kit, and identifying the filter needle being used for lidocaine. While some participants felt the OSCE was too long the length of the video is necessary to identify all steps concisely.

Table 1

Survey Participants

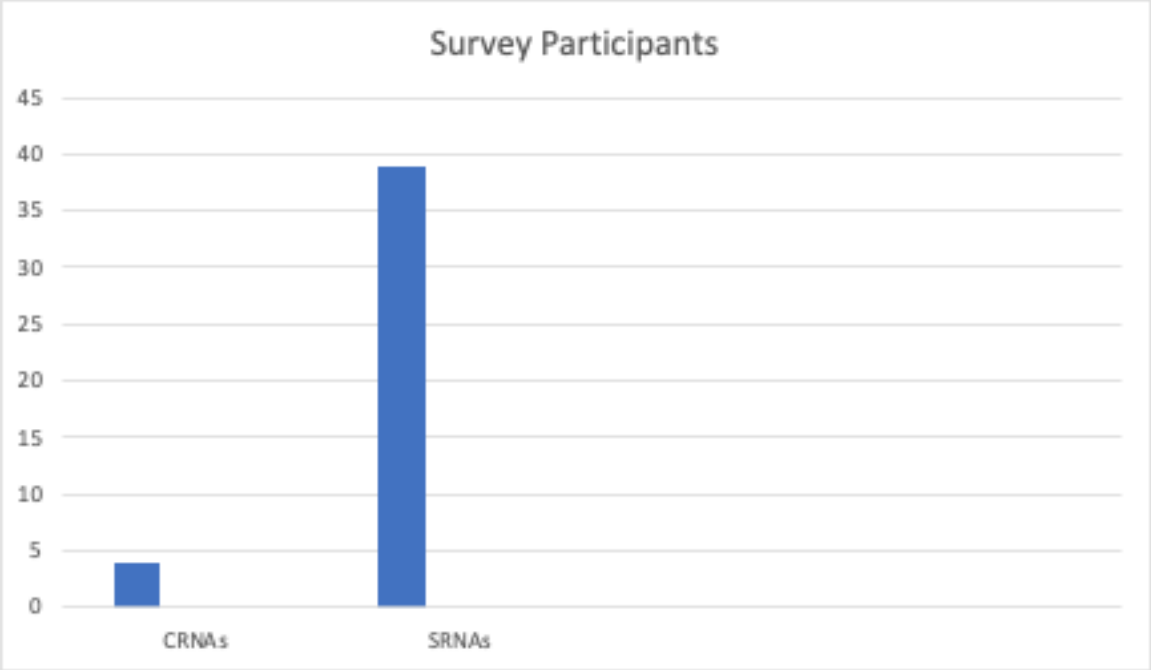

Table 2

Post-OSCE Review Survey: Comments and Suggests

Participant Classification	**Comments/Suggestions**
CRNA	● "It would be nice to have a list of supplies on a slide before showing or after showing the tray, also, slow the video down, there was not enough time for me to see each of the supplies on the tray and identify them. Also, when showing a static shot, please slow it down just a touch, as with the introduction slide, I did not finish reading the title before it switched. It may just be my computer player, but it is too fast. GREAT VIDEO, GREAT PROJECT!" ● "Excellent!!!" ● "Excellent works!"

Table 2 (continued).

SRNA	● "Was a filter needle used to draw up the lidocaine? For the landmark, the method is there a relationship btw the landmarks, like the vein is Xcm away from the carotid artery (medial or lateral)? How far should the guidewire be advanced? How far should the dilator be advanced? Should the central line be sutured in place?" ● "Great job"

Summary

With forty-three out of sixty-one participant responses, we were able to adequately access the value of our OSCE and its usefulness to SRNAs. We reviewed the participant answers and made the recommended changes to provide the best OSCE for SRNA education and clinical training. The use of this improved OSCE will aid in enhancing SRNA's skill in central line placement.

CHAPTER IV – CONCLUSION

Data was compiled from a literature review based on evidence-based practice to ensure best practice guidelines were followed in developing the OSCE. The design and development of this project were based on mandates from the AANA DNP Essentials. The purpose of this OSCE was to provide a safe and constructive setting for simulation and contribute to the curriculum used at USM in the NAP program.

Simulation of new procedures creates an opportunity to practice new skills that would usually cause a high level of stress. The OSCE allows SRNAs to learn the correct procedure for inserting intrajugular central lines without harming patients. In a simulated setting, students can learn from mistakes, ask questions, receive feedback and develop confidence before practicing in a clinical setting. Constructive feedback in a safe environment promotes patient safety and removes the fear of failure in a real-life setting for the SRNA.

Limitations of this DNP project include the number of participants, and the newness of this format of simulation for SRNA students enrolled in the NAP program at USM. Thirty-nine SRNAs and four CRNAs participated in the survey. Participation was strictly voluntary.

In the future, this OSCE tool could be used throughout the nurse anesthesia program to monitor for clinical progression. Using the tool for students of all levels and experience can help researchers better understand its usefulness for both beginners and those with more advanced skill levels. Introducing more CRNAs to the OSCE tool and

having them participate in the survey could determine the usefulness of the OSCE in the clinical setting, and whether changes should be made to the tool.

Summary

The OSCE was developed using evidence-based practice and best practice guidelines for insertion of intrajugular central lines using landmark-based and ultrasound-guided techniques. The tool was created to allow SRNAs to develop confidence in this procedure without the stress of a clinical setting. The participation in the project was limited to USM NAP faculty and students. However, feedback received was sufficient to make changes to and implement the OSCE into the curriculum at USM.

APPENDIX A – DNP Essentials

DNP Essential	How the Essentials Are Achieved
I. Scientific underpinning for practice	This doctoral project has an extensive review of evidence-based literature of the available knowledge of the best-practice guidelines for placement of central venous catheters using landmark guided and ultrasound-guided technique
II. Organizational and systems leadership for quality improvement and systems thinking	This doctoral project consisted of collaboration with a panel of experts to develop an OSCE that will provide standardized training and simulation of placement of central venous catheters using landmark guided and ultrasound-guided technique
III. Clinical scholarship and analytical methods for evidence-based practice	Research and analysis of the effectiveness of an OSCE in simulation and the essential need for SRNAs to be well versed in the placement of central venous catheters
IV. Information systems/technology and patient care technology for the improvement and transformation of healthcare	An OSCE was developed and presented to the panel of experts after research of best-practice guidelines and techniques that demonstrated the usefulness of central venous catheters in practice.
V. Healthcare policy for advocacy in healthcare	This OSCE creates a standard for SRNAs to practice and gain the skill set necessary for placing central venous catheters. The project advocates for competence training to be applied to the USM NAP clinical curriculum.
VI. Interprofessional collaboration for improving patient and population health outcomes	Communication and collaboration with CRNA faculty at USM was utilized to develop this OSCE and make recommended changes.
VII. Clinical prevention and population health for improving the nation's health	This doctoral project aims to reduce stress facing SRNAs in learning and performing new and challenging skills while improving healthcare outcomes for patients within the population.
VIII. Advanced nursing practice	Demonstrated a best practice recommended standardized assessment and instruction for simulation of and placement of central venous catheters.

APPENDIX B – Literature Matrix

Author/Title/Journal	Type of Evidence/Level of Research	Summary
American Association of Colleges of Nursing (AACN), 2006	Journal Article/Level IV	This article details the requirements for the doctorate education of advanced nursing practice.
Butterworth, J.F., Mackey, D.C., Wasnick, J.D., 2018	Book/Level V	This book details the importance and use of central venous catheters in the medical field as well as the steps for proper placement.
Chipas, A., Cordrey, D., Floyd, D., Grubbs, L., Miller, S., & Tyre, B., 2012	Journal Article/Level IV	This article details the stress placed on student registered nurse anesthetists.
Ferrada, 2020	Journal Article/Level IV	This article details the steps for placing an internal jugular central venous catheter.
Kolikof, J., Peterson, K., & Baker, A.M., 2021	Journal Article/Level V	This article details the necessity of central venous catheters in the medical field.
Ling, M.L., Apisarnthanarak, A., Jaggi, N., Harrrington, G., Morikane, K., Thu, L., Ching, P., Villanueva, V., Zong, Z., Jeong, J., Lee., C., 2016	Journal Article/Level III	This article details central line-associated bloodstream infections and ways to prevent them.
Saugal, B., Scheeren, T.L., & Teboul, J.-L., 2017	Journal Article/Level III	This article details how to place a central venous catheter using ultrasound.
Zayyan, M., 2011	Journal Article/Level V	This article details an obstructive structured clinical examination (OSCE).

APPENDIX C – OSCE Evaluation

Evaluation of the Objective Structured Clinical Evaluation (OSCE) for Ultrasound and Landmark Guided Approach for Internal Jugular Central Line Placement

Thank you for your voluntary participation in evaluating this OSCE. Feedback is integral and provides valuable information to researchers and in the future, SRNAs.

1. Do you consent to participate in the evaluation of the OSCE for ultrasound and landmark guided central line placement?	YES	NO
2. Are you a CRNA or an SRNA?	CRNA	SRNA
3. Was this OSCE beneficial in presenting clear and exact instructions on the insertion of the CVC using ultrasound?	YES	NO
4. After participating in this OSCE are you able to identify landmarks for the internal jugular vein more easily?	YES	NO
5. In your opinion, does this OSCE include all of the necessary information to help SRNAs be successful in the clinical area?	YES	NO
6. Is the OSCE the appropriate length?	YES	NO
7. Comments/Suggestions		

APPENDIX D - OSCE Template

ANESTHESIA OBJECTIVE STRUCTURED CLINICAL EXAM

Ultrasound and Landmark Guided Central Line Insertion

LEARNER OUTCOMES:

1. Be able to identify landmarks and anatomy for placement of a central venous catheter in the intrajugular vein without ultrasound
2. Be able to identify anatomy appropriately using ultrasound equipment
3. Select appropriate ultrasound equipment and settings for ultrasound-guided IV access.
4. Differentiate between veins and arteries using ultrasound.
5. Perform central venous access utilizing the ultrasound for guidance.
6. Understand and maintain sterility during insertion

DOMAINS: Clinical skill, Performance Assessment.

PURPOSE: Demonstrate the ability of the USM NAP student to utilize ultrasound guidance and landmarks to insert central venous catheters in the intrajugular vein

LEARNER OBJECTIVES:

1. Describe which patients require central venous access
2. Demonstrate the ability to utilize ultrasound guidance for central venous access
3. Demonstrate the ability to utilize landmarks and knowledge of anatomy for central venous access
4. Demonstrate the proper sterile technique
5. Analyze technique and learn from mistakes.

INDIVIDUAL OR GROUP OSCE: Individual

REQUIRED READING and ASSOCIATED LECTURES:

1. Kline, J. P. (2019). *Peripheral nerve blocks & ultrasound guidance for anesthesia providers*.

Chapters: 9 & 14

REQUIRED VIDEOS:

Sonosite, Inc. Peripheral Venous Access under Ultrasound Guidance Parts 1 & 2

https://www.youtube.com/watch?v=lREUPXCpK8Y

https://www.youtube.com/watch?v=riizCYcXhRU

REQUIRED PARTICIPANTS: USM NAP student, NAP faculty examiner, clinical skills lab staff.

VENUE: USM NAP clinical skills lab.

STUDENT LEVEL OF OSCE: Semester 1-4

TIME ALLOTTED: 20 minutes

RECOMMENDED PRACTICE PRIOR TO EXAMINATION: 20 minutes x 4 attempts = 80 minutes. 24

CONTENT OUTLINE

CONTEXT: (Background/story)

You are asked to come to the ICU to start a central venous line on a patient requiring vasopressors. The patient is a 62-year-old male who has been diagnosed with sepsis and is hypotensive and unresponsive to fluid challenge. Health history is significant for hypertension, type II diabetes, COPD and the patient has an infection on their RLE. He is 6’ 2”, 280 lbs., with a BMI of 35.9. The patient is intubated and sedated and receiving enteral nutrition via a nasogastric tube. Vital signs are as follows: HR 132, B/P 80/39, RR 16, SPO2 97%, T 102F.

Nurses attempted to correct the blood pressure with a fluid bolus, but the patient was not responsive. The patient is currently on a levophed infusion that is running through a peripheral IV at 4mcg/kg/min.

Gather the correct supplies to perform central venous access utilizing ultrasound guidance and landmark guided access.

EQUIPMENT & SUPPLIES:

Portable ultrasound machine

High-Frequency Linear Probe

Ultrasound gel

ChloraPrep™ (or similar antiseptic)

Central line kit

Central line Dressing

1” Plastic tape

Saline Lock

Saline Flushes and Caps

Human Volunteer

Ultrasound compatible IV access simulation model

Crash Cart

SITE SELECTION: The central venous catheter will be placed in the intrajugular vein

TASK STATEMENT: Your task is to discuss several patient populations that can present with the need for central venous access, demonstrate the use of the ultrasound in differentiating veins from arteries on a human volunteer, and start a central venous line on the simulation model using ultrasound guidance.

PROCESS:

1. Prepare the appropriate equipment (central line kit, sterile gowns, sterile gloves, and ultrasound equipment).
2. Ensure access to a crash cart due to potential detrimental outcomes with CVC placement
3. Discuss why the patient needs central venous access (pressor requirement, CVP monitoring)
4. Wash and dry hands
5. Demonstrate proper donning of sterile gown, gloves, and ultrasound probe covering
6. Properly cleanse the simulation model for central venous catheter puncture.
7. Demonstrate proper usage of the ultrasound in scanning the neck for the intrajugular vein.
8. Correctly differentiate an artery from a vein on a live OSCE patient by clinical indicators
   (non-compressible and pulsatile = artery; non-pulsatile and compressible = vein).
9. Inject lidocaine subcutaneously
10. Flush all lumens of the line and ensure caps are available for all lumens
11. Take needle attached to a syringe and using landmarks and/or ultrasound, insert the needle into the intrajugular vein
12. Aspirate blood and remove the syringe
13. Insert the wire, and keep hold of the inserted wire
14. Remove the needle
15. Use a scalpel to make a small incision in the skin
16. Pass the dilator over the wire and dilate a tract through the intrajugular vein
17. Remove the dilator and insert the central line over the wire, continuing to hold onto the wire
18. Once the central line is placed, remove the wire
19. Aspirate and flush all lumens and apply caps to the lumens

20. Suture the line to allow fixation
21. Dress the line with a clean and sterile dressing

DEBRIEFING FORM:

Student Debriefing Form

1. What could you have done better?

2. What did you do well?

3. Do you have any comments or questions about the exercise/OSCE?

ASSESSMENT

Rubric for Ultrasound and Landmark Guided Central Venous Catheter Access

	TASKS	PASS	FAIL
*	1. Prepare the appropriate equipment		
	2. Discuss why the patient needs central venous access (pressor requirement, CVP monitoring)		
	3. Wash and dry hands		
*	4. Demonstrate proper donning of sterile gown, gloves, and ultrasound probe covering		
*	5. Properly cleanse the simulation model for central venous catheter puncture.		
*	6. Demonstrate proper usage of the ultrasound in scanning the neck for the intrajugular vein.		

*	7. Correctly differentiate an artery from a vein on a live OSCE patient by clinical indicators (non-compressible and pulsatile = artery; non-pulsatile and compressible = vein).		
*	8. Inject lidocaine subcutaneously		
*	9. Flush all lumens of the line and ensure caps are available for all lumens		
*	10. Take needle attached to a syringe and using landmarks and/or ultrasound, insert the needle into the intrajugular vein		
*	11. Aspirate blood and remove the syringe		
*	12. Insert the wire, and keep hold of the inserted wire (does not let go of the wire until removal)		
*	13. Remove the needle		
*	14. Use a scalpel to make a small incision in the skin		
*	15. Pass the dilator over the wire and dilate a tract through the intrajugular vein		
*	16. Remove the dilator and insert the central line over the wire, continuing to hold onto the wire		
*	17. Once the central line is placed, remove the wire		
*	18. Aspirate and flush all lumens and apply caps to the lumens		

	19. Suture the line to allow fixation		
	20. Dress the line with a clean and sterile dressing		

Steps with ***** Must be properly completed. All steps must be completed/passed to receive a passing grade.

The OSCE performed by the student demonstrates foundational knowledge and correct use of the ultrasound machine in obtaining central venous line access using landmarks and ultrasound-guided techniques: (Circle one) PASS FAIL

Does the student need to repeat this OSCE at a later date to satisfy learning requirements? (Circle one) YES NO Date to return for evaluation: _____

EXAMINER: _____ DATE: _____

APPENDIX E – 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 template on Cayuse IRB.
- The period of approval is twelve months. An application for renewal must be submitted for projects exceeding twelve months.

PROTOCOL NUMBER: IRB-21-224
PROJECT TITLE: An Objective Structured Clinical Examination for Central Line Placement Using Ultrasound and Landmark Guided Technique
SCHOOL/PROGRAM: Leadership & Advanced Nursing, School of PRNP
RESEARCHER(S): Hannah Redden, Michong Rayborn, Morgan Jones

IRB COMMITTEE ACTION: Approved
CATEGORY: Expedited
7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

PERIOD OF APPROVAL: July 8, 2021

Donald Sacco Jr.

Donald Sacco, Ph.D.
Institutional Review Board Chairperson

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