Fall 2023

An Objective Structured Clinical Examination for Pediatric Inhalation Induction and Nasotracheal Intubation

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AN OBJECTIVE STRUCTURED CLINICAL EXAMINATION FOR PEDIATRIC INHALATION INDUCTION AND NASOTRACHEAL INTUBATION

by

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

Approved by:

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December 2023

Published by the Graduate School

ABSTRACT

Inhalation induction and nasotracheal intubation are two vital parts of anesthesia when caring for the pediatric population. Student Registered Nurse Anesthetists (SRNAs) must be knowledgeable of the significant differences in anesthetizing an adult versus a child and be able to perform the skills associated with putting the pediatric population to sleep. These specialized skills may be challenging to perform on an actual patient without simulation and practice. The Nurse Anesthesia Program (NAP) faculty at The University of Southern Mississippi (USM) recognized that there was a gap between learning about the skills in didactic courses and successfully performing in clinical.

This doctoral project was designed to create an Objective Structured Clinical Examination (OSCE) to help educate and evaluate the SRNAs at USM on properly performing an inhalation induction and nasotracheal intubation on a pediatric patient. In addition to an educational tool, a step-by-step video was performed to help demonstrate the procedure to SRNAs. The OSCE is supported by evidence-based practice and was thoroughly evaluated by USM's Nurse Anesthesia Program faculty and SRNAs. To find ways to help improve the OSCE, a survey was conducted to evaluate its effectiveness of the OSCE. Based on the survey results, the OSCE is concluded to have the potential to positively impact SRNAs by being better prepared for clinical, which can potentially improve patient safety.

ACKNOWLEDGMENTS

We would like to extend our deepest gratitude to our committee chair, Dr. Michong Rayborn. This doctoral project would not have been possible without her constant encouragement, support, and dedication. Thank you for the leadership, guidance, and expertise that you offered to us throughout this entire process! We would also like to thank our committee member, Dr. Mary Jane Collins, for her time and efforts in making the OSCE a success!

DEDICATION

I would like to dedicate this project to my family, friends, and mentors, who have supported and encouraged me throughout this three-year journey! Thank you all for your unconditional love and support in allowing me to make my dreams a reality! Thank you, mom and dad, for teaching me the value of diligence and hard work and always encouraging me to chase my dreams! Without you, I would not be where I am today! I owe all of my success to my Lord and Savior, Jesus Christ. None of this would be possible without His provision and faithfulness in my life. - *Laura Beth Hailey*

I want to dedicate this project to several important people in my life. You have supported me throughout anesthesia school, this project, and life. To my family, you have been the best support system, and I cannot thank you enough for your patience and love during this journey! Mom and Dad, you will never know how much you mean to me and how grateful I am for all the support you both show me daily. Without your constant love and encouragement, I would not be where I am today. Laura Beth, I am so thankful we got to experience this journey together; I could not have asked for a better DNP partner or friend! Most importantly, I would not be here without Jesus Christ, my Lord, and Savior. He has placed all the pieces together for this to happen, and it is only because of His mercy and grace that I am here today. - *Alexa Hogan*

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LIST OF ABBREVIATIONS

AACN	American Association of Colleges of Nursing
AANA	American Association of Nurse Anesthesiology
COA	Council on Accreditation
CRNA	Certified Registered Nurse Anesthetist
DNP	Doctor of Nursing Practice
ETT	Endotracheal Tube
FRC	Functional Residual Capacity
IM	Intramuscular
IV	Intravenous
NAP	Nurse Anesthesia Program
NIT	Nasotracheal Intubation
OR	Operating Room
OSCE	Objective Structured Clinical Examination
SIM	Simulation
SRNA	Student Registered Nurse Anesthetist
U.S.	United States
USM	The University of Southern Mississippi

CHAPTER I – INTRODUCTION AND BACKGROUND

According to the American Association of Nurse Anesthesiology (AANA), Certified Registered Nurse Anesthetists (CRNAs) provide anesthetics to a wide variety of patients in varying practice settings and for different types of procedures (American Association of Nurse Anesthesiology [AANA], 2022). The Council on Accreditation of Nurse Anesthesia Educational Programs (COA) requires a specific number of surgical cases in various specialty areas for the SRNA to graduate. Therefore, SRNAs travel to numerous sites to gain experience in the full range of anesthesia procedures. During this time, SRNAs develop hands-on skills in the operating room (OR). Programs across the United States (U.S.) have varying plans of study regarding clinical rotation.

Simulation (SIM) laboratories help develop tactile skills in a simulated environment; however, there are limitations to simulating actual patient situations. Therefore, Objective Structured Clinical Examinations (OSCEs) were developed as educational tools to minimize the learning curve by researching the specific steps needed to complete a skill. OSCEs can be utilized in numerous areas across the healthcare system to train and evaluate the abilities of current and future healthcare providers. For example, SRNAs can practice in SIM laboratories before getting into the clinical environment. The goal of an OSCE is to provide a template that standardizes training, assessment, and evaluation of knowledge and hands-on skills.

Problem Description

CRNAs and SRNAs are expected to meet specific standards of care which are required by the AANA. According to the Standards of Nurse Anesthesia Practice published by the AANA, “These standards are put into place with intentions to support

the delivery of patient-centered, consistent, high-quality, and safe anesthesia care…" (AANA, 2018. p. 1). Equipment checks, proper consent, monitoring alarms, and documentation are some of the standards for which CRNAs and SRNAs are held responsible.

Currently, The University of Southern Mississippi (USM) is partnering with 22 clinical sites, which allows SRNAs to practice a diverse array of anesthesia methods and practices. Staff CRNAs precept SRNAs at each of the clinical sites. As the SRNA progresses through the program, the expectations of the observing CRNAs constantly increase, and more autonomy is given to the student. Creating an OSCE helps to standardize steps in skill and can be used as a tool to minimize anxiety and stress for the SRNA. Incorporating OSCEs into SIM laboratories before starting clinical practice provides the SRNA with an opportunity to commit the skill to muscle memory before entering the stressful clinical setting. The OSCE also provides constructive feedback to the SRNA through debriefing in a low-stakes environment in the simulation lab before practicing on an actual patient.

Pediatric anesthesia is quite different from adult anesthesia. The SRNA must learn the differences in pediatric airway anatomy, the process in which pediatrics are put to sleep, and the steps to insert a nasotracheal tube. Nasotracheal tubes are commonly used in the pediatric population for various procedures in the head and neck region. Nasotracheal tubes are inserted through the nose, down through the vocal cords to the trachea allowing better isolation and good surgical access for intraoral procedures (Prasanna & Bhat, 2013). Students must be confident in their ability to identify the different induction methods used in the pediatric population, insert a nasotracheal tube

efficiently, and understand the indications for placing one. Practicing this skill in the simulation laboratory helps to prepare SRNAs to perform the task in a clinical setting.

Purpose and Context

The student needs to learn and understand pediatric and adult airway anatomy differences. One difference, for example, is a child's larynx is seated higher in the neck and slightly more anterior, which could change the way a child should be positioned for laryngoscopy (Coté et al., 2019). The student must understand the different induction practices used in the pediatric population and the reasons behind these differences. Therefore, fully understanding the pediatric airway anatomy and the process of induction is extremely important for the SRNA before entering the clinical setting.

The creation of this OSCE will provide the SRNA with a standardized tool to learn the steps to inhalation induction and nasotracheal intubation in the pediatric population. Utilizing the OSCE to practice pediatric inhalation induction and nasotracheal intubation in the simulation setting will prepare the student for success when the time comes to perform on a real child. In addition, the OSCE provides a way for the faculty of USM to gauge the SRNA's performance by providing constructive feedback on improvement areas.

The OSCE can be utilized as a standardized tool for the faculty and a checklist of steps for the SRNA to practice before being evaluated by the teacher. To allow the faculty to assess the SRNA's readiness for clinical practice, this OSCE will provide the proper steps for pediatric inhalation induction and nasotracheal intubation. SRNAs can practice pediatric cases in the simulation lab, and instructors can give immediate evaluation and feedback. As the student progresses through the course, the faculty can

increase the level of difficulty to enhance skills and foster critical thinking resulting in improved readiness for actual clinical practice. SRNAs should be confident in their abilities when the time comes to perform in the OR.

Available Knowledge

Airway Anatomy

There are several reasons children need surgical procedures, both elective and emergent. Anesthesia providers must know the pediatric airway anatomy before providing care to this population. “When compared to adults, infants and neonates have a considerably larger head and tongue, more narrow nasal passages, an anterior and cephalad larynx, a longer epiglottis, and a shorter trachea and neck (Butterworth et al., 2018, p. 899). Many differences exist between adult and pediatric airway anatomy that influence bag-mask ventilation and intubation. The variations in the pediatric airway contribute to different bag-mask sizes and laryngoscope blades. For example, “A straight blade is generally more suitable for use in infants and young children than a curved blade because it better elevates the base of the tongue to expose the glottic opening” (Coté et al., 2019, p. 250). In addition, the SRNA should be knowledgeable of the subglottic narrowing in the pediatric population. The proper size endotracheal tube should be used to help prevent the risk of airway damage and poor patient outcomes. “A range of diameters of tracheal tubes appropriate for the child’s age, as well as tubes 0.5 mm in diameter smaller and larger, should always be available” (Barash et al., 2017, p. 1239).

By utilizing the OSCE, students will learn the differences in pediatric and adult airway anatomy and induction procedures and demonstrate the skill of inserting a nasotracheal tube. In addition, the SRNA will be knowledgeable of the equipment needed

to safely perform these skills. As with any patient undergoing anesthesia, anesthetists must consider the pediatric patient's specific characteristics and history/background to develop a safe and effective patient care plan.

Inhalation Induction

There are varying techniques for inducing anesthesia in pediatrics, the most common being inhalation induction by mask with Sevoflurane. Depending on the child's age, the anesthetist could bear hug the patient and hold the mask in place, or if the child is old enough, the child could hold it. Typically, a 70% Nitrous Oxide and 30% Oxygen mixture is administered to the child while gradually increasing the Sevoflurane up to 8%, or until adequate anesthetic depth is achieved. Once the inhalation anesthetic is adequate, proper positioning for surgery and the application of monitors would be the next step. After confirming the appropriate anesthetic depth, the intravenous (IV) angio-catheter should be placed for drug and fluid administration.

The SRNA needs to understand the risk of laryngospasm on induction with inhalational agents. Succinylcholine and Atropine should always be drawn up in a syringe with an intramuscular (IM) needle attached in case the child has a laryngospasm before IV access is obtained. "Succinylcholine, a depolarizing neuromuscular blocker, is very effective in treating laryngospasm but comes with potentially serious side effects such as bradycardia and arrhythmias" (Collins et al., 2019, para. 1). Pediatric patients are heart rate dependent; therefore, atropine is also indicated when Succinylcholine is used.

When anesthetizing pediatric patients, some modifications must be made to the sequence of events before going to sleep. A patent airway is essential in pediatric patients due to the high risk of obstruction. Using a circle breathing system, hypoventilation from

obstruction or leak can be detected quickly by monitoring end-tidal carbon dioxide in this population.

The pediatric population has higher alveolar ventilation and decreased functional residual capacity (FRC) when compared to adults. The higher minute ventilation-to-FRC ratio contributes to the rapid increase in alveolar anesthetic concentration and, in combination with higher perfusion to the brain, accelerates inhalation induction (Butterworth et al., 2018). Due to the increased speed of inhalation induction, the blood/gas coefficients of the anesthetic gasses are decreased when compared to the adult population.

Nasotracheal Intubation

Nasotracheal Intubation (NTI) is a skill that the anesthetist must master for intraoral surgeries such as dental restorations or procedures on the head and neck region. NTI involves inserting an endotracheal tube through the nare, into the nasopharynx, and through the trachea, which is usually done in the OR after induction of general anesthesia (Folino et al., 2022). A thorough airway assessment must be done before determining which nasotracheal tube should be inserted. The nostril in which the child breathes most easily should be selected (Butterworth et al., 2018). Choosing the nostril that is the largest and moves more air is vital to successful tube advancement. Researchers conclude that narrow nasal passages and septal deviation usually complicate the advancement of the nasotracheal tube (Enk et al., 2002).

Before attempting to insert a nasotracheal tube, the SRNA must know and understand the anatomy of the nasopharynx, oropharynx, hypopharynx, and larynx. In addition, the SRNA must be knowledgeable of highly vascularized areas of the

nasopharynx and essential steps to decrease the risk of epistaxis, otherwise known as nasal bleeding, before inserting a nasotracheal tube. For example, Phenylephrine nose drops constrict blood vessels and shrink mucous membranes, which allows for decreased bleeding during the passage of the nasotracheal tube (Butterworth et al., 2018). Appropriate size tube selection is important in minimizing epistaxis and maintaining adequate ventilation. “The size of cuffed ETT may be estimated using the formula: Age (in years)/4 + 3 (for children < 2 years) or +3.5 (for those > 2 years)” (Barash et al., 2017, p. 1239).

Another way to prevent epistaxis is by placing the nasotracheal tube in a warmed saline solution before intubation. Warming allows the tube to become softer and pliable, decreasing the risk of extreme bleeding on insertion. One study proved this theory by concluding that the incidence of epistaxis following nasotracheal intubation was significantly less with prewarmed tracheal tubes than with regular tracheal tubes (Sangada et al., 2019). In this study, the nasotracheal tubes were put in a bottle of normal saline and stored in a warmer set to 45 degrees Celsius. Prior to getting the nasotracheal tube from the warmer, a thermometer was used to check the temperature of the warmer. Checking the temperature of the warmer before nasotracheal intubation can decrease the risk of overheating the tube and causing burns to the vocal cords and trachea. Once the tracheal tube is warmed, the temperature of the warmer checked, and the nostril is premedicated with Phenylephrine, the tracheal tube can be lubricated with water-soluble jelly.

Much like preparing for endotracheal intubation, adequate preoxygenation is vital to wash out nitrous oxide with oxygen to allow enough time to insert the nasotracheal

tube without deoxygenation. The nasotracheal tube can be inserted after preoxygenation, patient head positioning, and induction medications. According to researchers, “With gentle, steady pressure, insert the tube directed towards the occipital protuberance on the back of the skull with the bevel turned towards the nasal septum (Prasanna & Bhat, 2013. p. 5). The tube should be slowly inserted until it can be visualized in the oropharynx, and then direct laryngoscopy and advancement of the tube with Magill forceps. Magil forceps are used to advance the balloon on the nasotracheal tube past the vocal cords and into the trachea; however, the anesthetist must be careful not to damage the cuff on the nasotracheal tube. NTI should be avoided in patients with coagulopathy problems, skull fractures, facial fractures, or any type of nasal obstruction (Prasanna & Bhat, 2013).

Impact on Student Registered Nurse Anesthetists

SRNAs face many emotional, financial, and mental challenges during the three rigorous years in the Nurse Anesthesia Program. Creating and implementing a standardized approach to anesthesia skills can help reduce extreme levels of stress and alleviate clinical anxiety. Structured clinical assessment tools can improve consistency with clinical skills and help SRNAs identify areas of weaknesses that need to be strengthened. OSCEs are also beneficial in aiding the student in assessing and recognizing adverse effects or reactions to procedures or skills and ways to treat these effects while maintaining patient safety. The OSCE is an assessment tool that can provide high-impact training to students and allow them to feel better prepared in challenging clinical situations (Solà et al., 2017).

Rationale

CRNAs and SRNAs alike must be able to give and manage anesthesia of the pediatric population. As stated above, knowledge of pediatric airway differences is essential when deciding what airway tools are needed for safe intubation. Creating an OSCE for pediatric inhalation induction and nasotracheal intubation will aid in SRNAs feeling more prepared when entering his/her pediatric anesthesia clinical rotation. OSCEs are based on the latest evidence-based practices and utilize research to build a step-by-step guide to providing safe, efficient care by the anesthetist. The implementation of this OSCE focuses on enhancing patient safety, improving patient outcomes, and increasing SRNAs' knowledge and clinical skills.

Specific Aims

The objective of this doctoral project was to implement an OSCE for pediatric inhalation induction and nasotracheal intubation that will aid in SRNAs' preparedness for their clinical rotation in pediatrics. The OSCE will present clear step-by-step instructions and guidance for the performance of inhalation induction and nasotracheal intubation in pediatrics and a method to assess the student’s ability to execute the task in the SIM laboratory. Furthermore, by practicing their skills in the SIM laboratory, students will gain a foundation of knowledge, resulting in reduced stress when asked to perform the skill in clinical practice.

DNP Essentials

There are eight Doctor of Nursing Practice (DNP) essentials outlined by the American Association of Colleges of Nursing (AACN) that are utilized by colleges that offer DNP degrees. “These Essentials outline the foundational competencies that are core

to all advanced nursing practice roles, including the four nationally-recognized Advanced Practice Registered Nursing roles: nurse practitioners, clinical nurse specialists, nurse anesthetists, and nurse midwives" (American Association of Colleges of Nursing [AACN], n,d., para. 1). The fundamental essentials for this OSCE project are aimed specifically at Essentials I, VI, and VIII.

- Essential I: Scientific Underpinnings for Practice were met by analyzing and acquiring data from evidence-based practice on pediatric inhalation induction and intubation. An OSCE was designed using this research to improve SRNAs' clinical experience and learning.
- Essential VI: Inter-Professional Collaboration for Improving Patient and Population Health Outcomes was met by composing an OSCE that will promote clinical preparedness and increase patient safety because of the knowledge and practice in the SIM laboratory.
- Essential VIII: Advanced Nursing Practice was met by designing a tool to teach anesthesia students the skills of pediatric inhalation induction and nasotracheal intubation based on recent research and data.

Zaccagnini and White (2015) recognize the quality and depth of a DNP degree advancement to CRNA education and offer great credibility to the profession (Zaccagnini & White, 2015).

Summary

The OSCE will help educate and provide a critical knowledge base for the pediatric rotation. Pediatric inhalation induction and nasotracheal intubation are different from adult induction and intubation and thus will require thorough practice to gain

confidence before performing in the clinical setting. Using the OSCE as a guide and evaluation tool for constructive criticism, the SRNA will be adequately prepared to provide the best possible care with minimal stress.

CHAPTER II – METHODOLOGY

Introduction

The aim of this doctoral project was to provide SRNAs with a standardized assessment tool to utilize and become proficient at pediatric induction and nasotracheal intubation. Although pediatric anesthesia is rare in some clinical facilities, SRNAs need to understand the variances in pediatric airway anatomy and know the proper inhalation induction and nasotracheal insertion steps to provide safe patient care. The research and creation of an OSCE for pediatric inhalation induction and nasotracheal intubation offer a way to evaluate SRNAs in a simulation setting before performing in the clinical setting. The purpose of this OSCE was to increase confidence through step-by-step guidance of the clinical skill, which will further improve patient safety.

Context

The USM NAP is a doctoral degree program that follows a three-year study plan. The current NAP admission rate is 25 students per year. The first year's study plan is 100% didactic courses, either face-to-face or online. The SRNAs must advance through a variety of anesthesia and doctoral research courses to reach the clinical portion of the program. The second and third-year plan of study transitions to a meticulous clinical-based curriculum while also maintaining enrollment in anesthesia and doctoral research courses.

Second-year students learn the fundamentals of pediatric anesthesia in NUR 842, which is titled Advanced Principles of Anesthesia Practice I (University of Southern Mississippi [USM], 2020). In addition, pediatric simulation laboratories are incorporated throughout this portion of the program. Using the simulation laboratory helps SRNAs

prepare for various clinical skills related to pediatric anesthesia. Practice simulations help reduce student anxiety and allow the student to experience the OR environment and flow.

Current evidence-based best practices were utilized to create this OSCE. The benefits and drawbacks of various methods of pediatric induction and nasotracheal intubation were evaluated. Implementing safe, evidence-based practices can improve patient outcomes. The creation of this OSCE will provide education to SRNAs and offer step-by-step guidance on practicing skills needed to provide safe, efficient pediatric anesthesia in the clinical environment.

Design

Steps

The OSCE topic was discussed with NAP faculty members and approved before initiating the doctoral project. After reviewing the available literature, the doctoral project was presented and proposed to the Doctor of Nursing Practice (DNP) project committee members to validate its applicability to clinical practice. Once the DNP project committee approved the doctoral project, it was then submitted to USM's IRB and referenced by protocol number IRB 22-700 for further approval. After IRB approval, the further evidence-based practice was reviewed, and the OSCE was developed. As stated above, the purpose of the OSCE was to teach current best practices to SRNAs by developing a guide for pediatric inhalation induction and nasotracheal intubation skills.

Participation Recruitment and Evaluation

A panel of experts was explicitly chosen to evaluate and provide feedback on the doctoral project. The panel consisted of five USM NAP instructors, who are also currently practicing CRNAs and second and third-year SRNA students. The second-year

students provided heavy didactic feedback, while the third-year students provided both didactic and clinical experience. The currently practicing CRNAs offered first-hand pediatric anesthesia experiences and expertise. The OSCE evaluation tool, along with the OSCE video, additional visual aids, and a step-by-step guide to the skills, were sent to the NAP faculty and SRNAs via email, followed by a survey. Participation in the study was strictly voluntary, and feedback remained anonymous.

Once the deadline to complete the survey was met, the confidential feedback was reviewed and analyzed for potential revisions in the doctoral project's intentions. Any modifications or concerning results from the survey were reported and discussed with the DNP project committee members. After final adjustments, the OSCE was presented at DNP Scholarship Day.

Intervention

An OSCE tool was created after recognizing a knowledge gap in pediatric inhalation induction and nasotracheal intubation among USM's SRNAs. The goal of this doctoral project was to enhance the knowledge and skills of SRNAs at USM. Utilization of this OSCE by the SRNAs in the NAP at USM will also help reduce sources of stress and create a sense of confidence in clinical skills. The doctoral project contains the OSCE, a feedback questionnaire (taken after the educational sources are utilized), and a survey for feedback to identify the effectiveness of the OSCE. The intervention is the feedback from the survey provided by current SRNAs and faculty at USM for the OSCE of pediatric inhalation induction and nasotracheal intubation.

Measures

The implementation of this doctoral project at USM will aid in strengthening the education of SRNAs. The OSCE will prepare SRNAs with enhanced knowledge and improved skillset in pediatric anesthesia. In addition, the OSCE will increase student confidence and reduce unfavorable patient outcomes directly linked to incompetent skills. In addition, using this OSCE will better prepare students to provide safe anesthesia when entering clinical. Once the OSCE is available for SRNAs, the students will be able to access a rubric for evaluation, a list of equipment needed for pediatric induction and nasotracheal intubation, a step-by-step guide for each skill, and a real-life patient scenario to practice in the simulation laboratory. After reviewing the OSCE, current USM faculty and SRNAs will complete a survey of the OSCE's effectiveness and provide additional feedback on any area that needs adjustments.

Data Collection and Analysis

As mentioned above, a survey was conducted to attain qualitative and quantitative data for assessing the OSCE. The OSCE, including the template, supporting materials, and the survey, was sent to NAP faculty and SRNAs via email. The data will be unidentified and anonymous. The survey was created using an online survey tool, Qualtrics™, and contained pertinent information related to the OSCE. The survey is located in Appendix C and includes the following statements with a Likert scale grading tool:

1. Do you consent to participation? YES NO
2. What is your current level of practice?

CRNA (NAP faculty) 2nd-year SRNA 3rd-year SRNA

3. The information in the OSCE is clear, concise, and easy to understand.
4. The OSCE provides information that is evidence-based and relevant.
5. The length of the OSCE is appropriate.
6. The OSCE shows evidence of doctoral-level work.
7. Implementation of this OSCE will be beneficial to SRNAs who are learning how to manage pediatric patients.
8. After completing the OSCE, I am more confident in my ability to perform pediatric inhalation induction and nasotracheal intubation.
9. Please provide any additional feedback or suggestions for this OSCE.

After the respondents completed the survey and provided feedback, the results were analyzed. Finally, the data was reviewed and evaluated to see what improvements could be made to the OSCE.

Ethical Considerations

The doctoral project was developed using current, best-practice guidelines on pediatric inhalation induction and nasotracheal intubation. If approved and incorporated into the NAP curriculum, there is still a potential risk of unstandardized evaluation if the OSCE is not implemented by each faculty member. Therefore, it is essential to stress the need to fully adopt and incorporate the OSCE to allow for standardized tools SRNAs can utilize when learning these skills.

The panel of experts and students with access to the feedback questionnaire were assured that participation in the survey would be strictly voluntary and responses would remain anonymous. Each of the participants received a letter regarding informed consent as well as a statement about the lack of repercussions for not participating. Also, the

participants had the opportunity to completely log out of the browser and stop the survey at any point. Therefore, there are no conflicts of interest with this doctoral project. This doctoral project was submitted to the IRB to validate that ethical considerations were met.

Summary

Improved patient safety was the focal point of creating this OSCE. Creating and implementing the OSCE assessment tool will help SRNAs understand the steps of pediatric inhalation induction and nasotracheal intubation. The OSCE will also aid in increasing SRNA confidence in the clinical setting by strengthening the knowledge and skill set related to pediatric anesthesia.

The development of this OSCE has the potential to strengthen the curriculum of the USM NAP by encouraging SRNAs to practice hands-on simulation in a low-stakes learning environment. Practicing and perfecting skills in the simulation laboratory can improve both SRNA confidence and patient safety outcomes. Current evidence-based practices were the basis for the development of the OSCE. The survey results issued to participants provided feedback and were utilized to strengthen the OSCE assessment tool further. Minor adjustments were made to the OSCE, and the finalized doctoral project was presented to the NAP faculty to incorporate into the USM curriculum.

CHAPTER III –RESULTS

After sending email invitations to prospective participants, results were collected and evaluated. A total of 43 requests for participation to evaluate the OSCE were sent to 38 students and five NAP CRNA faculty. The results from the 34 responses are listed in the following figures and table. Figure 1 illustrates the demographic results of the thirty-four participants. Figures 2 and 3 are post-education survey question responses from questions 7 and 8 on the survey. Upon analysis of the responses to the survey questions, the results show that one hundred percent of the participants thought the OSCE was advantageous, was presented clearly and concisely, was the appropriate length, and can be beneficial to SRNAs learning pediatric anesthesia.

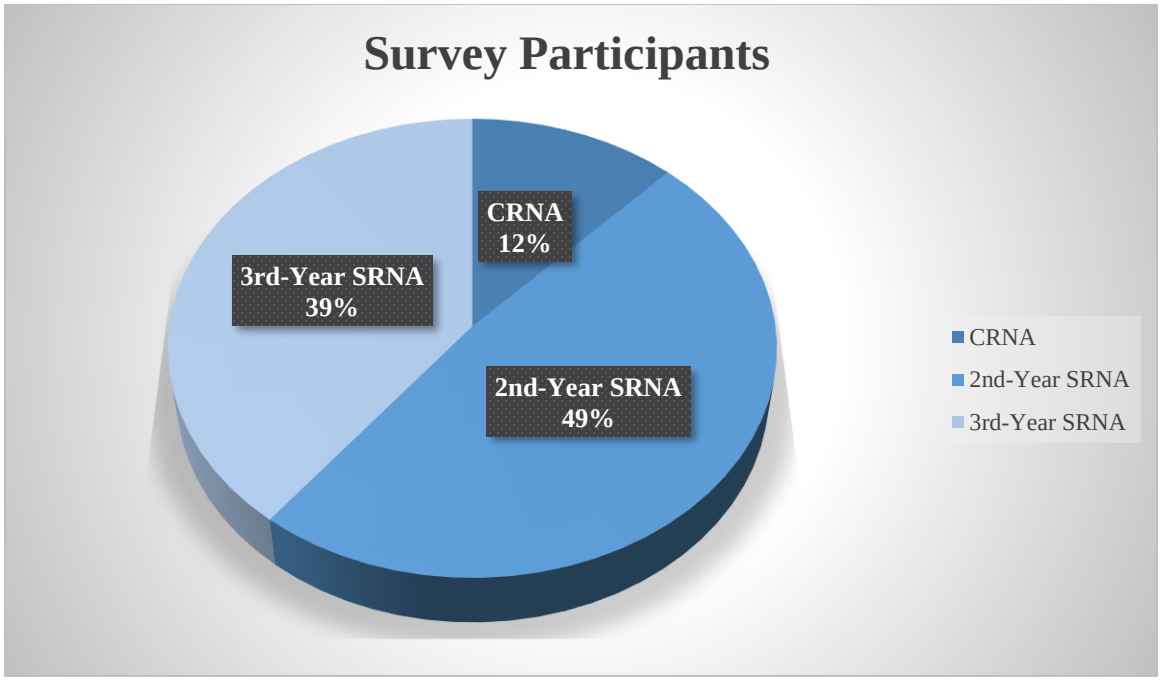

Figure 1. Survey Participants

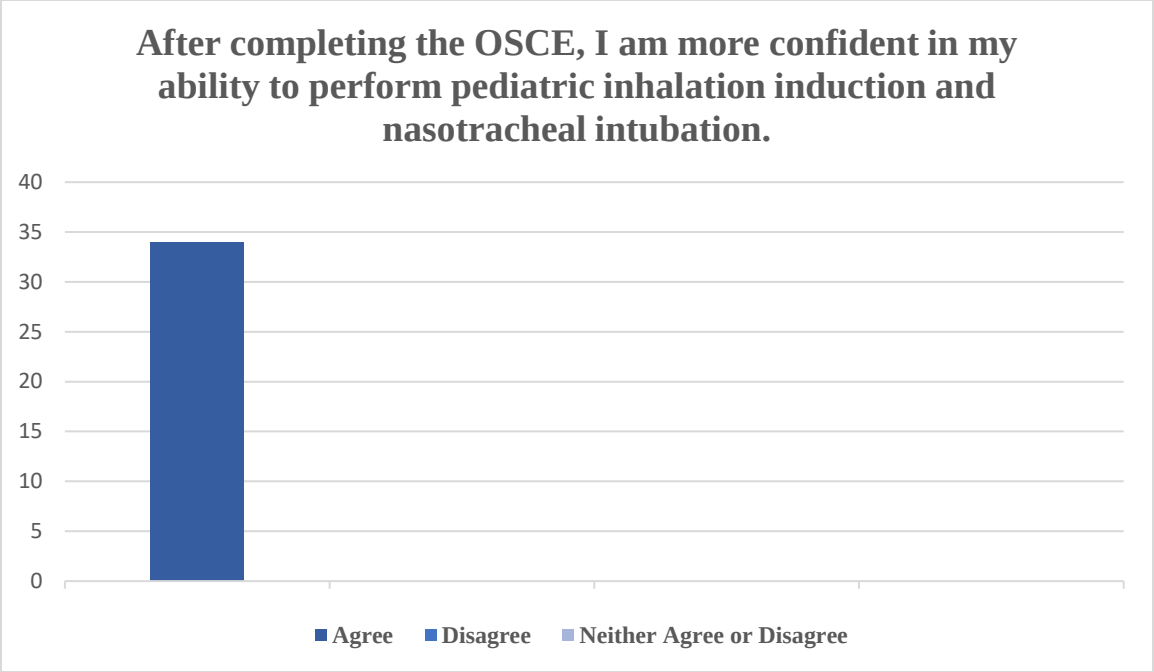

Figure 2. Post-Educational Survey Question 7: Responses from CRNAs and SRNAs

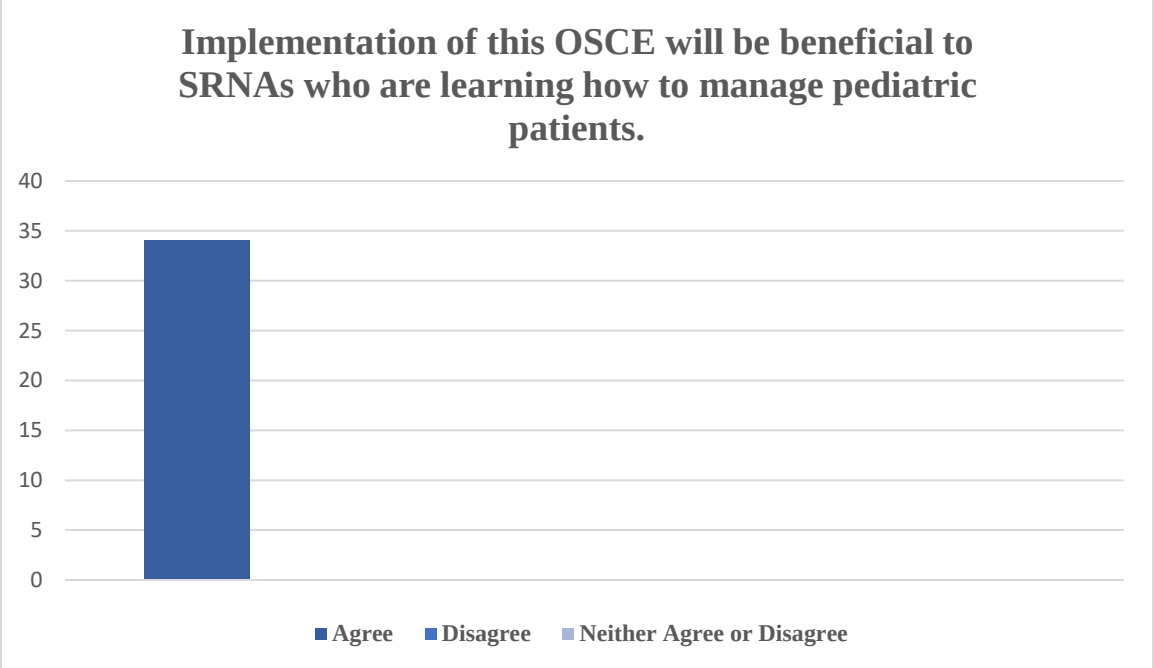

Figure 3. Post-Educational Survey Question 8: Responses from CRNAs and SRNAs

The recommended changes include stating that the patient would be in the supine position for intubation, and protection of the eyes, and stating that assistance may be warranted for starting an IV catheter. Table 1 shows recommendations from participants, including recommended changes and other feedback. After examining the feedback, we made the proposed changes, including stating that the patient should be laid down supine once adequate inhalational anesthesia is given, using tape for protection of the eyes, and stating that an assistant could place the IV while the SRNA or CRNA is continuing the inhalational anesthetic before intubating.

Table 1

Post-OSCE Review Survey: Comments and Suggestions

Participant Classification	**Suggestions/Comments**
CRNA	• "Very organized and well done. Thank you!" • "OSCE Steps: You may want to clarify "deep enough" on a couple of the steps, supine position for intubation, protecting eyes (is tape the method of choice?), and may need assistant for IV start. Great job!" • "Great detail work and great video!"
SRNA	• "Very well thought out. The process flows nicely." • "Great learning tools!" • "Excellent job!!!!!"

Summary

The value of the OSCE was assessed by evaluating the results of the thirty-three responses gained from the anonymous OSCE evaluation survey. Each survey response

was assessed, and the necessary changes were made to strengthen the doctoral project further. The participants provided vital feedback to assess how impactful the OSCE can be for second and third-year SRNAs. Incorporating this OSCE into USM's NAP will powerfully strengthen the SRNA's ability to perform pediatric inhalation induction and nasotracheal intubation.

CHAPTER IV – CONCLUSION

Individuals who completed the OSCE survey agreed that the pediatric inhalation induction and nasotracheal intubation OSCE were clear, concise, and easily understood. Survey respondents also agreed that the OSCE contained current, evidence-based material that applies to anesthesia practice. Additionally, respondents unanimously agreed that the OSCE was beneficial in preparing to manage pediatric patients. Incorporating second and third-year SRNAs as well as practicing CRNAs into the evaluation of the OSCE contributed to the strength of the research. Data collected from these three groups of professionals provides insight from various levels of experience. The doctoral project aims to provide SRNAs with a standardized tool with current best-practice guidelines on pediatric inhalation induction and nasotracheal intubation. The incorporation of the OSCE can provide a step-by-step guide for SRNAs to utilize when practicing pediatric anesthesia. Results from the survey illustrate that this doctoral project meets the initial objective of potentially helping build confidence in SRNAs and improving patient safety through improved preparation regarding pediatric anesthesia. In addition to better preparing SRNAs for pediatric anesthesia, the OSCE can also be incorporated into other teaching curriculums to offer a standardized tool for pediatric surgical care.

Limitations

There are a couple of limitations associated with this doctoral project. One limitation was the number of participants that completed the survey. The small sample size possibly restricted the overall number of comments and/or critiques made by participants. Incorporating more practicing CRNAs into the population size would have

increased the amount of feedback collected from the survey and could have possibly offered more constructive comments for improvements. Although the population size is small, key stakeholders, such as the USM NAP faculty, were included as participants, which helps provide high-quality feedback for data collection. A second limitation of this doctoral project was that all participants are affiliated with USM, potentially leading to bias and resulting in skewed survey data. However, this doctoral project's strengths and evidence-based quality far outweigh the limitations.

Summary

The pediatric inhalation induction and nasotracheal intubation OSCE was constructed using evidence-based practice and demonstrate current, best practice guidelines. Incorporating the OSCE tool into USM's NAP will allow SRNAs to develop essential skills in providing pediatric anesthesia, potentially improving SRNA confidence and reducing stress in the clinical setting. Furthermore, this doctoral project could also be utilized by other anesthesia programs, medical schools, or pediatric healthcare institutions to provide a standardized tool for training and education.

APPENDIX A – DNP Essentials

DNP Essential	How the Essentials Are Achieved
I. Scientific Underpinnings for Practice	Through extensive research of the latest evidence-based practice for pediatric inhalation induction and nasotracheal intubation to improve safety and patient outcomes.
II. Organizational and Systems Leadership for Quality Improvement and Systems Thinking	The OSCE included collaboration with a panel of experts to create a standardized training tool on pediatric inhalation induction and nasotracheal intubation.
III. Clinical Scholarship and Analytical Methods for Evidence-Based Practice	The use of literature and evidence in creating this OSCE provides quality care and patient safety.
IV. Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Healthcare	The doctoral project was created and proposed to a panel of experts to create a standardized tool using current and best evidence-based practices found using technology.
V. Healthcare Policy for Advocacy in Healthcare	Development of this OSCE provides a way for SRNAs to gain skills necessary to competently go to clinical and perform. This advocate for improved learning for students that are a part of USM's anesthesia program.
VI. Interprofessional Collaboration for Improving Patient and Population Health Outcomes	The OSCE was refined by collaborating with CRNA faculty at USM through constructive feedback mechanisms aimed at strengthening the doctoral project.
VII. Clinical Prevention and Population Health for Improving the Nation's Health	This doctoral project aims to improve patient safety outcomes by reducing the stress that SRNAs face when challenged with new clinical skills.
VIII. Advanced Nursing Practice	Improving the performance of skills like pediatric inhalation induction and nasotracheal intubation increases clinical readiness and allows students to provide quality patient-centered care.

APPENDIX B – Literature Matrix

Author/Title/Journal	Type of Evidence/Level of Research	Summary
Barash, P., Cahalan, M., Cullen, B., Stock, M., Stoelting, R., Ortega, R., Sharar, S., & Holt, N. (2017). *Clinical anesthesia.* (8th ed.). Wolters Kluwer.	Book - Level V	The book details the basics of pediatric anesthesia.
Butterworth, J., Mackey, D., & Wasnick, J. (2018). *Morgan & Mikhail's Clinical Anesthesiology* (6th ed.). McGraw Hill Education.	Book - Level V	The book explains the value and use of nasotracheal intubation and inhalation induction in pediatrics.
Coté, C. J., Lerman, J., & Anderson, B. J. (2019). *A practice of anesthesia for infants and children* (6th ed.). Elsevier.	Book - Level V	The book details the specifics of pediatric anesthesia, including airway management, induction procedures, and nasotracheal intubation techniques.
Enk, D., Palmes, A. M., Van Aken, H., & Westphal, M. (2002). Nasotracheal intubation: A simple and effective technique to reduce nasopharyngeal trauma and tube contamination. *Anesthesia & Analgesia, 95*(5), 1432–1436. https://doi.org/10.1097/00000539-200211000-00061	Journal Article - Level II	This article details techniques used to reduce nasopharyngeal trauma when inserting a nasotracheal tube.

Folino, T. B., Mckean, G., & Parks, L. J. (2022). Nasotracheal intubation. *StatPearls*. https://www.ncbi.nlm.nih.gov/books/NBK499967/	Book - Level V	This book contains several best-practice steps for safely inserting a nasotracheal tube. It also details information on airway anatomy.
Prasanna, D., & Bhat, S. (2013). Nasotracheal intubation: An overview. *Journal of Maxillofacial and Oral Surgery*, *13*(4), 366–372. https://doi.org/10.1007/s12663-013-0516-5	Journal Article-Level VI	This article details indications and complications that can arise after nasotracheal intubation.
Sangada, B., Agrawal, A., Chauhan, D., & Sharma, T. (2019). Does prewarming of tracheal tubes prevent epistaxis following nasotracheal intubation? A prospective, randomised, single-blind study. *Airway: Official Publication of All India Difficult Airway Association*, *2*(2), 77–80. https://doi.org/10.4103/arwy.arwy_14_19	Journal Article - Level II	This article demonstrates if prewarming of the tracheal tube before nasotracheal intubation results in less epistaxis.
Solà, M., Pulpón, A. M., Morin, V., Sancho, R., Clèries, X., & Fabrellas, N. (2017). Towards the implementation of OSCE in undergraduate nursing curriculum: A qualitative study. *Nurse Education Today*, *49*, 163–167. https://doi.org/10.1016/j.nedt.2016.11.028	Journal Article-Level VI	This journal article shows a qualitative study with the use of OSCE.

Zaccagnini, M. E., & White, K. (2015). *The doctor of nursing practice essentials*. (3rd ed.). Jones and Bartlett.	Book - Level V	This book details the essentials of nursing practice.

APPENDIX C – OSCE Evaluation

Evaluation of the Objective Structured Clinical Evaluation (OSCE) for Pediatric Inhalation Induction and Nasotracheal Intubation

Thank you for your voluntary participation in the evaluation of this OSCE. Feedback is fundamental in providing valuable information to SRNA researchers.

	Agree	Neutral	Disagree
1. I consent to participate in the evaluation of this OSCE.			
2. The information presented in the OSCE is clear, concise, and easy to understand.			
3. The OSCE provides information that is evidence-based and relevant.			
4. The length of the OSCE is appropriate.			
5. The OSCE shows evidence of doctoral-level work.			
6. Implementation of this OSCE will be beneficial to SRNAs who are learning how to manage pediatric patients.			
7. After completing the OSCE, I am more confident in my ability to perform pediatric inhalation induction and nasotracheal intubation.			

8. Check the one that applies: CRNA (NAP faculty), 2nd-year SRNA, or 3rd-year SRNA

9. Please provide any additional feedback or suggestions for this OSCE:

APPENDIX D – OSCE Template

ANESTHESIA OBJECTIVE STRUCTURED CLINICAL EXAM

Pediatric Inhalation Induction and Nasotracheal Intubation

LEARNER OUTCOMES:

The student will be able to:

1. Identify the anatomical differences in the pediatric airway.
2. Demonstrate knowledge of pediatric induction methods.
3. Appropriately select equipment for pediatric inhalation induction and nasotracheal intubation
4. Perform nasotracheal intubation safely.

DOMAINS: Assessment, Didactic Knowledge, Clinical Skill

PURPOSE: Exposure to pediatric anesthesia with a demonstration of the ability to perform pediatric inhalation induction and nasotracheal intubation to improve clinical performance.

LEARNER OBJECTIVES:

1. Demonstrate understanding of the anatomy differences between adult and pediatric individuals.
2. Identify indications for nasotracheal intubation
3. Demonstrate the ability to utilize specific equipment needed to perform inhalation induction and nasotracheal intubation.
4. Appropriately demonstrate the proper steps for inhalation induction and nasotracheal intubation, including the equipment necessary.
5. Analyze clinical skills and self-evaluate the technique.

INDIVIDUAL OR GROUP OSCE: Individual

REQUIRED READING and ASSOCIATED LECTURES:

1. Barash, P., Cahalan, M., Cullen, B., Stock, M., Stoelting, R., Ortega, R., Sharar, S., & Holt, N. (2017). *Clinical anesthesia.* (8th ed.). Wolters Kluwer.

   Chapter 43

2. Butterworth, J., Mackey, D., & Wasnick, J. (2018). *Morgan & Mikhail's Clinical Anesthesiology* (6th ed.). McGraw Hill Education.

   Chapters 19 & 42

3. Coté, C. J., Lerman, J., & Anderson, B. J. (2019). *A practice of anesthesia for infants and children* (6th ed.). Elsevier.

   Chapters 1, 4, & 14

REQUIRED VIDEOS: Pediatric Inhalation Induction and Nasotracheal Intubation Demonstration Video

REQUIRED PARTICIPANTS: SRNA volunteers, NAP faculty examiner, clinical skills lab staff

VENUE: The University of Southern Mississippi's School of Nursing Simulation Lab

STUDENT LEVEL OF OSCE: Semester 4-6 (2nd-year SRNA students)

TIME ALLOTTED: 30 minutes

RECOMMENDED PRACTICE PRIOR TO EXAMINATION: Required readings X 2, required videos X 2, review of OSCE Scenario and expected performance, review of Pediatric Inhalation Induction and Nasotracheal Intubation steps X 2.

STUDENT LEVEL OF OSCE: Semester 4-6 (2nd-year SRNA students)

TIME ALLOTTED: 30 minutes

RECOMMENDED PRACTICE PRIOR TO EXAMINATION: Required readings X 2, required videos X 2, review of OSCE Scenario and expected performance, review of Pediatric Inhalation Induction and Nasotracheal Intubation steps X 2.

CONTENT OUTLINE

CONTEXT:

You are assigned a 9-month-old female scheduled to receive anesthesia for cleft palate repair. She weighs 9 kilograms and is 27 inches tall. The mother states that the patient has no past medical history, no allergies, and has been NPO since 10:35 pm. No pertinent family history related to anesthesia. The mother denies any recent sinus congestion or infection. On physical examination, the patient has an MP-1, TMD-3, and the right name appears larger than the left.

EQUIPMENT & SUPPLIES:

- Anesthesia Machine with appropriate pediatric circuit
- Pediatric manikin
- Monitors: (should be on Pediatric mode)
    - EKG
    - Pulse oximeter
    - Blood pressure
    - End-tidal carbon dioxide
    - Temperature probe
- Size/Age appropriate airway equipment
    - Face mask
    - Nasotracheal tube (Nasal RAE)

        - ETT size= 4 + age/4
        - For this scenario:
            - 3.0-3.5 cuffed
            - 4.0 uncuffed
    - Laryngoscope Handle
        - Lighter/shorter handle
    - Laryngoscope Blade
        - Mac 2 or Miller 1
- Appropriate syringe for cuff inflation (if using cuffed tube)
- Tape
- Suction setup (including Yankauer)
- Nasal airway for dilation
- Magill forceps
- Sevoflurane
- Drug carts, syringes, and needles
    - Specifically, atropine and succinylcholine with an IM needle attached
- 1 L bottle of warmed Normal Saline
- Lubricating jelly
- Phenylephrine nasal spray
- Stethoscope
- IV fluids
- IV start kit and angio-catheter
- Increase OR temperature

- Pediatric crash cart
- Appropriate size orogastric tube
    - Can decompress the stomach if over-ventilation occurs during induction/intubation

SITE SELECTION: N/A

TASK STATEMENT: Your task is to demonstrate an understanding of pediatric inhalation induction and nasotracheal intubation by appropriately identifying anatomical variances in airway anatomy, steps to induction, and the process of nasotracheal intubating a child.

PROCESS:

1. Prepare the appropriate equipment (See equipment/supplies listed above)
2. Place the nasotracheal tube in warmed normal saline. (This is done during room setup- before bringing the patient to the OR)
3. Appropriately secure the child in a sitting position and administer 70% Nitrous Oxide and 30% Oxygen mixture while gradually adding Sevoflurane up to 8% through the face mask.
4. Identify when the child is deep enough to be laid down (supine) on the OR table.
    a. The child will have his/her eyes closed and no longer fighting
5. Demonstrate proper placement of monitors.
6. Tape both eyes carefully.
7. Continue administering the gas mixture, ensure the child is deep enough, then obtain IV access.

a. An assistant may be needed at this point to help get IV access while continuing to mask the child.

8. Place 2-3 squirts of Phenylephrine nasal spray in each nare.
9. Insert a nasopharyngeal airway in the selected nare.
10. Continue administering the gas mixture until the child is at 1.5-2 MAC.
11. Remove the nasotracheal tube from warm normal saline and apply lubricating jelly to the cuff.
12. Remove the nasopharyngeal airway.
13. Insert the nasotracheal tube with the bevel towards the nasal septum.
14. Once the tip of the tube is in the nare, advance the tube by pushing 'toward the floor'.
15. Slowly advance the tube to the oropharynx.
16. Perform direct laryngoscopy and advance the tube with the Magill forceps. (Be careful not to place the forceps on the balloon cuff)
17. Once the balloon is past the vocal cords, inflate the cuff and check for proper placement.

    *If using an uncuffed Nasal RAE tube, you will not have a cuff to inflate. Check for proper placement.
18. Validate positive ETCO2 reading, bilateral chest rise, and equal breath sounds bilateral.
19. Secure the tube in place with tape.

DEBRIEFING FORM:

1. What objectives were you able to demonstrate correctly?

2. Identify areas of weakness.

3. Were you satisfied with your ability to work through the simulation?

4. Do you feel that this OSCE prepared you for clinical practice?

ASSESSMENT

Rubric for Pediatric Inhalation Induction and Nasotracheal Intubation

	TASKS	PASS	FAIL	COMMENTS
*	1. Prepare the appropriate equipment			
*	2. Place the nasotracheal tube in warmed normal saline. (This is done during room setup- before bringing the patient to the OR)			
*	3. Appropriately secure the child in a sitting position and administer 70% Nitrous Oxide and 30% Oxygen mixture while gradually adding Sevoflurane up to 8% through the face mask.			
	4. Identify when the child is deep enough to be laid down on the OR table.			
*	5. Demonstrate proper placement of monitors.			
*	6. Tape both eyes carefully.			
*	7. Continue administering the gas mixture, ensure the child is deep enough, then obtain IV access.			
*	8. Place 2-3 squirts of Phenylephrine nasal spray in each nare.			
*	9. Insert a nasopharyngeal airway in the selected nare.			

*	10. Continue administering the gas mixture until the child is at 1.5-2 MAC.			
	11. Remove the nasotracheal tube from warm normal saline and apply lubricating jelly to the cuff.			
*	12. Remove the nasopharyngeal airway.			
*	13. Insert the nasotracheal tube with the bevel towards the nasal septum.			
*	14. Once the tip of the tube is in the nare, advance the tube by pushing 'toward the floor'.			
*	15. Slowly advance the tube to the oropharynx.			
*	16. Perform direct laryngoscopy and advance the tube with the Magill forceps. (Be careful not to place the forceps on the balloon cuff)			
*	17. Once the balloon is past the vocal cords, inflate the cuff and check for proper placement. *If using uncuffed Nasal RAE tube, just check for proper placement.			
*	18. Validate positive ETCO2 reading, bilateral chest rise, and equal breath sounds bilateral.			
*	19. Secure the tube in place with tape.			

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 pediatric inhalation induction and nasotracheal intubation sequence: (Circle one)

PASS FAIL

Does the student need to repeat this OSCE to satisfy learning requirements? (Circle one)

NO YES 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 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:	22-700
PROJECT TITLE:	An Objective Structured Clinical Examination for Pediatric Inhalation Induction and Nasotracheal Intubation
SCHOOL/PROGRAM	Leadership & Advanced Nursing
RESEARCHERS:	PI: Alexa Hogan Investigators: Hogan, Alexa~Rayborn, Michong~Hailey, Laura~
IRB COMMITTEE ACTION:	Approved
CATEGORY:	Expedited Category
PERIOD OF APPROVAL:	02-Jun-2022 to 01-Jun-2023

Donald Sacco Jr.

Donald Sacco, Ph.D.
Institutional Review Board Chairperson

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