FIBER-OPTIC INTUBATION WORKSHOP AND CLINICAL COMPETENCE: AN EXPERIMENTAL STUDY

by

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A capstone project proposal submitted to the School of Nursing
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DNP Capstone Project Approval Form

This is to certify that Raymond Masters
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successfully defended his/her Capstone project entitled:
Fiber-Optic Intubation Workshop and Clinical Competence: An Experimental Study

on November 29, 2016
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Acknowledgments

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Abstract

Background Failure in airway management remains a significant source of morbidity and mortality. Fiber-optic intubation (FOI) experience is unpredictable and there is potential that Student Registered Nurse Anesthetists (SRNA) will be unprepared to effectively use this equipment upon graduation. Literature suggests that simulation is an appropriate teaching method for techniques such as fiber-optic simulation.

Objective: The purpose of this study is to compare clinical competence, perceived competence, self-confidence, and satisfaction scores with FOIs among nurse anesthesia (NA) students with the usual advanced airway education, to students who receive an educational simulation training program on the use of the fiber-optic scope during a FOI scenario.

Theoretical Framework: Patricia Benner’s From Novice to Expert framework was used as a context for this project.

Methods: An experimental design was used for competence using timed FOIs as the measure. The intervention group received an educational airway management workshop. Both groups were evaluated in a fiber-optic simulation scenario. Self-rating questionnaires were also distributed.

Results: Mean time to conduct a FOI decreased 241.54 seconds among the experimental group, which was found to be significant (p = 0.001). Participants reported much higher perceived competence levels after attending the workshop. Participants also reported high levels of self-confidence and satisfaction.

Discussion: Data confirmed that the FOI workshop was successful in improving clinical competence among SRNAs and such workshops could be incorporated into NA programs.

Keywords: Fiber-optic, airway, management, intubation, simulation, education.
Fiber-Optic Intubation Workshop and Clinical Competence

Certified Registered Nurse Anesthetists (CRNAs) claim to be experts in airway management. Are nurse anesthetist programs providing adequate exposure to advanced airway equipment for graduates to be characterized as experts, or even competent in these skills? For some low-volume skills, such as FOI, there may be inadequate exposure during training creating a potential for new graduate CRNAs being unprepared to perform such skills competently.

According to Baker, Weller, Greenland, Riley, and Merry (2011) deliberate practice, immediate feedback, problem-solving and evaluation with opportunity to repeat and modify behavior are essential in the attainment of expert performance. Failure in airway management remains a significant source of morbidity and mortality and advanced airway management is a necessary skill for every anesthesia provider (Kennedy, Cannon, Warner, & Cook, 2014). Poor judgement and lack of education and training remain major contributory factors to major airway complications. Human error is implicated in as many as 80% of anesthetic incidents (Baker, et al., 2011).

Purpose

The purpose of this study is to compare clinical competence, perceived competence, and self-confidence scores among nurse anesthesia students with the usual advanced airway education to students who received an educational simulation training program on use of the fiber-optic scope during a fiber-optic intubation scenario.

Results provided an assessment of the effectiveness of the University at Buffalo’s current education of the use of advanced airway equipment, specifically, the fiber-optic scope. It also evaluated the effectiveness of an educational simulation workshop allowing SRNAs to practice
FOIs and determined its effect on clinical competence. The results of this study could be used as an education guideline and simulation algorithm for the NA program.

**Background and Significance**

The fiber-optic intubation is the gold standard for management of known or predicted difficult airway (Moore, Smith, Curry, Gaspar, & Nelson, 2014). It is imperative that anesthetists be competent in this essential skill. Fiber-optic scopes are difficult to use if the operator is inexperienced. Providers must have confidence and experience with advanced airway equipment to use them effectively and safely. Traditionally, anesthetists learn much of their airway management skills inside the operating room. Apprenticeship training is, however, very unpredictable in terms of exposure to appropriate cases. Practitioners are often self-taught or are taught by their colleagues and use devices without any formal instruction. Incorrect use of equipment has led to fatal outcomes (Baker, 2015).

It is important that CRNA students have adequate familiarity and exposure not only to the difficult airway algorithm but competence in use of advanced airway equipment. The incorporation of simulation-based training with advanced airway management is one solution to mediate this problem. Literature suggests that simulation is an appropriate teaching method for techniques such as fiberoptic simulation (László et al, 2018). According to Kennedy, Cannon, Warner, and Cook (2014) simulation-based airway management curriculum is superior to no intervention or non-simulation intervention for education outcomes and further research is required to optimize curriculum design. Few studies have addressed use of simulation as an education evaluation tool to enhance training of anesthesia providers in difficult airway management and there is a clear need for studies to examine these effects (Lucisano & Talbot, 2012).
Literature Review

An article by Baker et al. (2011) examined the current state of education in airway management. They found that in airway management, poor judgement, education, and training are leading causes of patient morbidity and mortality. Traditional education models that rely on experimental learning in the clinical environment are inconsistent and inadequate. There is a need for curriculum change that includes competency-based medical education that will assess clinical ability and will take place as part of the education outside of the clinical environment. Simulation was presented as a potential way of enhancing learning without placing patients at increased risk. Airway workshops have been utilized for decades, but they are often not part of educational curriculum despite most participants at such workshops reporting improvements in accuracy and confidence in previously unfamiliar airway devices. They also suggested that practitioners need to understand their equipment and diversify their airway skills to cope with a variety of clinical presentations. The authors concluded that an explicit definition of airway management in the curriculum as a clinical fundamental should lead to a greater formalization of airway training programs.

Goldmann and Ferson (2005) proposed that despite the use of alternative training methods and efforts to structure training, it remains a challenge that every anesthesia trainee gains sufficient experience in the use of the fundamentals of airway management. It is necessary to address the responsibilities of everyone involved in the training process. The authors critically reviewed traditional and recent modalities of anesthesia, including training and assessment of value, and they described a multi-modal approach to airway management education. They concluded that although many studies have shown the ability of various training modalities to improve performance in many airway management techniques, there are no good comprehensive
studies investigating value of different training approaches to reduce anesthesia-related morbidity and mortality.

Kennedy, Cannon, Warner, and Cook (2014) conducted a systematic review and meta-analysis of the literature on teaching airway management using technology-enhanced simulation. The study included observational and controlled trials instructing medical professionals in direct laryngoscopy, fiberoptic intubation, surgical airway, and/or supraglottic airway using technology-enhanced simulation. Seventy-six studies were included of 10,904 studies screened. They found that in comparison with no intervention, simulation training improved outcomes for knowledge and skill but not for behavior or patient outcomes. In comparison with non-simulation interventions, simulation training was associated with increased learner satisfaction, improved skills, and patient outcomes, but not knowledge. The limitation of this review was its heterogeneity and variation in quality among primary studies. The authors concluded that simulation-based airway management curriculum is superior to no intervention and non-simulation intervention for important education outcomes. Future research to fine-tune curricular design was also recommended.

Lucisano and Talbot (2012) studied the current literature on human patient simulation for preparing anesthesia and other healthcare providers for advanced airway management. A systematic review was conducted of articles published between 1990 and 2009 on advanced airway management for patients undergoing anesthesia and patients who are not. Four electronic databases were searched, and 34 articles were included in the analysis. The majority of studies included simulation education evaluation for a variety of medical, nursing, and allied health providers and students. Only six studies addressed the use of simulation as an educational or evaluation tool to enhance anesthesia provider training in difficult airway management. Those
studies included analysis of different types of training and the perceived value of simulated training, and evaluations of equipment. The authors found that few studies have analyzed effects of this modality on trainer skills and patient safety. Study designs varied widely. Despite their heterogeneity, outcomes of these studies support the effectiveness of this training modality. The findings of this review confirm that simulation may be an effective tool to teach airway management skills and provide support for techniques that may be used in the difficult airway algorithm for anesthesia providers.

Murray (2014) provided an overview of many recent studies that expand simulation curriculum for anesthesia education. He found that recent literature describes a curriculum that uses a range of simulation modalities, including part-task trainers, manikin-based simulation, virtual reality, in-situ techniques, screen-based simulations as well as encounters with standardized patients. A variety of studies describe the use of task-training devices to more effectively acquire skills such as fiber-optic intubation. The author summarized that a curriculum is emerging that utilizes a variety of simulation modalities as part of a more comprehensive educational strategy for anesthesia specialty training.

Moore, Smith, Curry, Gaspar, and Nelson (2014) conducted a research study that assessed how the implementation of a FOI simulation training effects CRNA competence and self-confidence. A pretest/post-test design was used to assess competence level as FOI times were collected before and after implementation of their intervention. Self-confidence was also assessed utilizing questionnaires. This study found that the mean time to conduct a FOI decreased significantly after simulation training and that participants reported high levels of satisfaction and self-confidence. Their study was limited to a small sample size of 20 anesthesia providers in the military which does not reflect all nurse anesthesia providers. They
recommended that future studies be conducted on more populations to assess whether these results are obtained with anesthesia providers in other settings.

The literature is clear in that NA programs rely heavily on the clinical setting to prepare students to perform certain skills such as fiber-optic intubation. Due to the unpredictable amount of exposure to FOI there is a potential for SRNAs to graduate and still be ill-prepared to perform this skill in clinical practice competently, especially in an emergency setting. A clear need was identified that needed to be addressed. The literature also shows that one way to address this problem is to incorporate more simulation training into NA curriculums. Based on current research a FOI workshop was developed which seeks to address this gap in education.

**Theoretical Framework**

In this capstone project the sample population included second, and third-year SRNAs. This population includes differing levels of experience and education regarding use of difficult airway equipment. Patricia Benner’s Novice to Expert theoretical framework was chosen as a guide for this capstone project. Benner’s theory takes into account increments in skilled performance based on experience as well as education. It provides a context for clinical knowledge development (Benner, 1982).

**Level I: Novice**

The first stage in Benner’s theory is the novice stage. This is a beginner level in which the provider has no experience with the situations in which they are expected to perform tasks (Benner, 1984). Novice practitioners are taught rules to guide their actions with respect to different attributes. Novices have an inability to use discretionary judgement. They are taught rules to guide their actions (Benner, 1982). They use these context-free rules to guide their task performance. Many SRNAs at University at Buffalo would be categorized as novices in difficult
airway management, especially with knowledge and use of difficult airway equipment including the fiber-optic scope. In the classroom setting, students are exposed to many of these devices but to a minimal degree. Most students have limited exposure to using this equipment in the clinical setting as scenarios that warrant their use are inconsistent in frequency. Even when opportunities do arise in the clinical setting, many times, students are asked to step aside and watch the skill instead of performing it as many preceptors feel uncomfortable allowing a student to use advanced airway equipment in high-risk situations.

**Level II: Advanced Beginner**

The second stage of this framework is the advanced beginner stage. The advanced beginner can demonstrate marginally acceptable performance. A practitioner who is an advanced beginner is one who has coped with enough real situations to note the recurrent meaningful aspects (Benner, 1982). In both the novice and advanced beginner stages the practitioner can only take in little of the situation because it is new and strange to them. They are focused on trying to remember the rules that they have been taught (Benner, 1982). Advanced beginners need assistance setting priorities as they are still developing the ability to recognize recurrent meaningful patterns in clinical practice. At this level the practitioner is still learning what is most important (Benner, 1982). It is likely that many of the SRNAs at University at Buffalo would not be categorized as advanced beginners or competent in FOI. There is limited exposure to this skill throughout the nurse anesthesia program. Some students may fall into this category if they had clinical scenarios and preceptors that allowed them to perform this skill practice. Implementing a simulated scenario allowing SRNAs to perform FOIs utilizing difficult airway equipment and high-fidelity simulators can provide a context of knowledge on which to rely in the clinical setting.
Level III: Competent

Competency is the third stage within this model. A competent provider is aware of how their actions affect long-range goals or plans. They are consciously aware of these plans and the plans dictate what is most in the current situation. For the competent provider, a plan establishes perspective, and is based on conscious, abstract, and analytical contemplation of the problem. Although the competent provider does not have the speed and flexibility of a practitioner at the proficient level, they do exhibit a level of planning and organization that does allow for efficiency. According to Benner (1982) most in-service education is aimed at the competent level of achievement. No matter what category SRNAs fall into, whether novice, advanced beginner or competent, the goal is to advance knowledge and practice with the advanced airway workshop. Knowledge and use of difficult airway equipment can be augmented by attending such a workshop.

Levels IV and V: Proficient and Expert

According to Benner 1982 proficient practitioners perceive situations as wholes, rather than in terms of aspects. Experience teaches the proficient provider what typical events to expect in a situation and how to modify the plan in response to such events (Benner, 1982). The expert provider has a vast amount of background experience and has an intuitive grasp of the situation. Experts have highly skilled analytical ability for new situations (Benner, 1982). These two levels of practice within this framework are above the level that was expected as an outcome of this FOI workshop, but the overall goal was to advance students towards the levels of proficient and expert practice.

To summarize, Benner’s Novice to Expert theory provided a framework for the implementation of a FOI workshop. This framework was used as a context to design an
educational intervention used to increase SRNA clinical competency with FOI. The implementation of such a workshop into The UB NA curriculum will promote patient safety and may increase clinical competence among SRNAs.

Methodology

Design

An experimental design was chosen for this capstone project. This project assessed the outcomes of competence, perceived competence, self-confidence, and satisfaction. The research team used various strategies to collect data used for comparison of the control and intervention groups.

Setting

The study was conducted at the UB School of Nursing in Buffalo, New York over one day in the Fall semester of 2018. The presentation portion of the intervention took place in a classroom setting with presentation capabilities. The hands-on portion of the intervention took place in the Patient Simulation Center at UB. This center includes an operating room with advanced monitoring, and a full body, computerized mannequin, along with a working ventilator with a gas delivery system.

Sample

After approval from the UB Institutional Review Board, 31 UB NA students were approached for participation in the research study. Second and third-year students were targeted since they have already received didactic instruction on FOI and advanced airway management within their coursework. The subjects were provided with a Research Information sheet (Appendix A) and the Confidentially of Information and Release for Still Photographs and Videotapes form (Appendix B) before the workshop.
Twenty-five subjects voluntarily consented to participate and were randomized into control and intervention groups. Of the 25 participants, 13 were second-year students and 12 were third-year students. The inclusion criteria were that the subjects must be enrolled in the UB nurse anesthetist program, be within their second or third year, and have had advanced airway instruction, which is currently provided in the airway management section of the UB curriculum. The first-year students were excluded from participation due to their lack of previous instruction with FOI and advanced airway management.

**Control and Intervention Groups**

The groups were randomized, ensuring an evenly distributed sample. Randomization occurred separately for both the second and third-year participants to a control and intervention group. Participants in the control group served as the comparison group. Both groups took the Assessment Survey (Appendix C) before attending the workshop and simulations to assess their previous experience with FOI and the fiber-optic scope. The control group performed their simulations prior to the workshop. The control group did attend the advanced airway workshop only after they were evaluated during the simulation scenario as it was important that every participant received the education. Following the workshop, the control group was dismissed. The intervention group attended the workshop and was evaluated afterward to assess the effectiveness of the intervention.

**Workshop Outline**

The “Workshop: Fiber-Optic Intubation and Simulation” (Appendix D) took place over a 120-minute period at the University at Buffalo in a classroom with presentation capabilities and the Patient Simulation Center. The workshop included an overview of content, a review of the fiber-optic scope and equipment, a review of fiber-optic intubation protocols (awake, asleep,
intraoral, and intranasal), as well as hands-on learning stations. Participants took part in hands-on activities at two separate stations. The first hands-on learning station included, intranasal and intraoral FOI techniques and proper use of associated equipment such as oxygen and suction. The second hands-on station included instruction on FOI for difficult airways, associated techniques such as instruction on how to assist with a FOI, and troubleshooting for commonly experienced problems. Participants also had the opportunity to ask questions and to physically perform the skills on mannequins.

**Asleep Fiber-Optic Intubation Scenario**

Participants performed an asleep fiber-optic intubation scenario (Appendix E). In this scenario the participants performed an asleep fiber-optic intubation in the simulation lab operating room. The patient had normal airway anatomy. The operating room was set up with the mannequin, the anesthesia machine, and all the necessary equipment for an asleep FOI. All participants were evaluated using this simulation scenario. The control group was evaluated prior to attending the FOI workshop and the intervention group was evaluated following the FOI workshop.

All participants were pre-briefed using a standardized script on the patient and situation, environment, scenario, and expectations. The scenario was performed with a volunteer playing the role an assisting CRNA who was present for intubation and able to assist the participant. The assistant was instructed to assist only as directed by the participant.

**Evaluation Instruments**

The assessment survey is a series of questions that were used to enhance the results of this research study and to get an assessment of the participants’ previous experience with FOI (Appendix C). Sample questions included current status in the program, previous experience
with the fiber-optic scope and with FOIs, and how well the current curriculum has prepared them for FOI.

A ten-item Perceived Competence questionnaire (Appendix F) was developed for this project to assess participant’s perceived competence level. This questionnaire was modeled after questionnaires used in studies with similar designs to this study. The questions addressed participant perceived confidence with their knowledge and skill with the fiber-optic scope and FOI. The questionnaire utilizes a seven-point Likert scale with ten self-report statements ranging from “strongly disagree” to “strongly agree”. Results are numbered one through seven with higher scores indicating higher perceived competence and lower scores indicating lower perceived competence. The survey was distributed to practicing CRNAs with FOI experience for evaluation to increase the reliability and validity. Feedback was incorporated into the survey prior to administering.

The National League for Nursing (NLN) Student Satisfaction and Self-Confidence in Learning questionnaire (Appendix G) was utilized to measure self-confidence and satisfaction scores. This questionnaire was originally developed for medical-surgical nurses. Permission was obtained to use a modified version of this instrument with “med-surg” questions reworded to “airway management” (Appendix H). The questionnaire utilizes a five-point Likert scale with a series of 13 self-report statements ranging from “strongly disagree” to “strongly agree”. This instrument was developed specifically for post-training evaluation; therefore, it was only given to participants after simulation training. The eight-item self-confidence subsection of this instrument a reported Cronbach’s alpha score of 0.87. The satisfaction subsection, which has five items, has a reported Cronbach’s alpha score of 0.94.
Data Collection

A convenience sample of 25 nurse anesthetist students with the usual airway management education were randomized into either the control or intervention group. A mannequin was set up in the simulation center with the anesthesia machine and necessary supplies and equipment for an asleep FOI. Provided to each participant was a brief difficult airway scenario of a supine patient who required a FOI because of a history of difficult intubation. Each participant was timed from picking up the scope to successful intubation and connecting the breathing circuit. The same scenario was given to each participant.

Initial timed intubations were completed with the participants in the control group. Following these simulations all participants, including both the control and intervention groups, met in a classroom where a 60-minute didactic lecture on the fiber-optic scope, difficult airway management, and protocols for awake and asleep FOI was presented. Following the lecture, participants then participated in hands-on stations where they were able to practice FOI on high-fidelity simulators and apply the knowledge that was presented in the lecture. After the practice session, the control group was dismissed, and the intervention group was assessed in the simulation scenario. The entire workshop took 120 minutes.

All participants were given the ten-item Perceived Competence questionnaire prior to attending the workshop and this survey was re-administered after attending the workshop.

All participants were given the 13-item adapted NLN Student Satisfaction and Self-Confidence in Learning questionnaire after the workshop to assess both self-confidence and satisfaction.
Data Analysis

Data were analyzed using Microsoft Excel and Statistical package for the Social Sciences (SPSS). The variables of competence, perceived competence, self-confidence, and satisfaction were analyzed.

Competence was measured by comparing the FOI times of the control and intervention groups. Participants were timed from picking up the scope to successful intubation and connecting the breathing circuit in real-time. An independent t-test was used to examine the statistical difference between the FOI times of the control and intervention groups.

All participants took the ten-item Perceived Competence questionnaire rating their perceived competence level. This questionnaire was given before participating in the simulations and workshop and was repeated following the simulation and workshop. The pre-test and post-test results were analyzed utilizing descriptive statistics.

Satisfaction and self-confidence were measured using the NLN questionnaire. Descriptive statistics were used to analyze participant’s perceived self-confidence and satisfaction levels. SPSS was used to analyze the minimum score, maximum score, and standard deviation from the responses.

Results

All participants took the Assessment Survey talk about previous experience (Table 1). Results of this survey confirmed that most of the participants had very limited exposure to this skill not only in the course curriculum, but also in the clinical setting. Twenty-four of the 25 participants had only performed a fiber-optic intubation between zero and five times. Of these 24 participants, nine had not even performed one FOI. In the open-ended responses students frequently commented on their lack of preparation in the current NA curriculum: “This program
has provided some knowledge about fiber-optic intubation, but very little hands-on skill training”
and “I have received minimal preparation for fiber-optic intubation. I have a basic understanding
of how to manipulate the scope” and “I find that the nurse anesthesia program is lacking in
providing adequate training for fiber-optic intubations. My only experiences using/practicing
with a fiber-optic scope have been in clinical rotations, and only a few times at a select few
sites”.

**Competence.** The mean time for FOI for the control group was 401.00 seconds
(standard deviation [SD] = 191.45) with a median of 405.5 seconds. Completion times ranged
from 99 to 600 seconds. The mean time for FOI for the experimental group was 159.46 seconds
(SD = 105.24) and the median time was 109 seconds. Times ranged from 71 to 381 seconds. An
independent t-was used to determine if there was a significant difference in time to intubate
between the control and experimental groups. The mean difference between groups was 241.54
seconds, and the median time decreased by 296.5 seconds. A statistically significant decrease in
time to intubate after training (t = 3.865; p = .001) was seen indicating improvement in
competence with FOI. The focus of this project was on improved FOI competence with a
decrease in time to completion of task; however, perceived competence, self-confidence, and
satisfaction in training were also addressed as shown in Table 2 and Figure 1.

**Perceived Competence.** Participants reported much higher perceived competence levels
after attending the workshop (Figure 2). The questionnaire utilizes a seven-point Likert scale
and results are numbered one through seven with higher scores indicating higher perceived
competence and lower scores indicating lower perceived competence. Mean pre-workshop score
was 2.21 and the mean post-workshop score was 5.6.
**Self-Confidence and Satisfaction.** On the NLN Self-Confidence subscale the total possible range is 8 to 40. Scores ranged from 24 to 40 with a mean of 34.88 (SD = 3.83) and a median score of 34.5. The results indicate that participants had a high level of self-confidence to perform a FOI after this training. On the NLN Satisfaction subscale the total possible range is 5 to 25. Participant scores ranged from 17 to 25. The mean score was 23.17 (SD = 2.37) and the median score was 24.5 indicating the participants were satisfied with the training. Unfortunately, this instrument is designed for post-training use only; therefore, results are limited because of comparison of pre- and post-outcomes of satisfaction and self-confidence.

**Discussion**

Findings showed a significant decrease in FOI time after training and practice. This decrease supports that the FOI workshop was effective in increasing competence in this skill. Participants also had much higher perceived competence scores after attending the FOI workshop. Additionally, results from the NLN questionnaire showed both satisfaction in the training and self-confidence levels were high after training. These results support the use of a FOI workshop to improve FOI clinical competence.

Having competence in FOI is a necessity for all anesthesia providers as they are considered experts in airway management. It is very important that new graduate CRNAs are adequately prepared to perform a FOI and are competent with use of difficult airway equipment. The clinical significance of safely performing a FOI is pertinent in terms of effects of inadequate tissue oxygenation. Brain cells are destroyed after four to six minutes without oxygen, and brain ischemia can result in a vegetative state or can lead to death (Moore, Smith, Curry, Gaspar, & Nelson, 2014). In this project, mean time to intubation decreased by more than four minutes which is clinically significant in terms of maintaining tissue oxygenation.
Successful outcomes of simulation training of the fiber-optic scope and FOI, as seen in this project, reflect the findings of previous research related to use of simulation as an effective tool for training in difficult airway management.

**Strengths and Limitations**

Several strengths were noted. This project identified an area of need in the NA course curriculum at UB and developed an intervention that addresses that need. The skill of FOI is one that is a very important to anesthesia practice as it is considered the gold standard of difficult airway management. There is potential that the results of this project could better prepare all future classes of SRNAs enrolled at UB.

This project was developed as a randomized experiment allowing for high validity and reliability of drawing conclusions from the intervention. In this case, the FOI workshop caused an increase in competence, perceived competence, self-confidence, and satisfaction scores among SRNAs. The experimental design allowed researchers to control extraneous variable ensuring validity. This study could be easily replicated on a larger scale and tested again.

Several limitations were also noted. The participants are all from the NA program at UB and this may not reflect all NA programs. Future projects would need to address if similar results are obtained with SRNAs in other programs.

The outcome of competency was limited by measurement of timed FOI of a normal airway. There are many reasons that FOI may need to be used to address difficult airways that were not assessed in this project. Future projects could utilize difficult airway simulation scenarios. Another limitation is that FOI was performed in a simulated environment, and it is not clear whether participants would perform in a similar manner with live patients.
Additionally, there were a limited number of tools to measure the outcomes of perceived competence, satisfaction, and self-confidence. The NLN questionnaire does have strong evidence of reliability and validity but the questionnaire is a self-report instrument and there are some questions about whether people are able to accurately self-assess. There is a possibility that participants may not accurately report their actual levels on these questionnaires. The Perceived Competence questionnaire was developed by the research team and; therefore, does not have a reliability or validity rating associated with it. This survey was sent to 10 practicing CRNAs with FOI experience for feedback which was incorporated into the survey to help establish validity.

**Recommendations**

This project demonstrated that a FOI workshop can result in positive outcomes in terms of competence, perceived competence, self-confidence, and satisfaction for SRNAs performing FOI airway management skills in a simulated environment. Future research projects could evaluate how participants’ skills transfer to actual patient care situations. Future studies could also evaluate the long-term effect of this workshop. Participants in the experimental group performed their simulations soon after attending the workshop. Assessing how participants perform weeks or even months after attending the workshop could be beneficial.

This FOI workshop could be incorporated into the UB NA program. The workshop has proven to be effective in increasing clinical competence among SRNAs and the results of this study indicate that there is room for improvement in the current curriculum. This workshop design could also be reproduced for other skills, especially high-risk, low-volume skills.

**Ethical Considerations**

Approval by the University at Buffalo Internal Review Board was obtained for this capstone project (Appendix I). There was minimal risk as the participants were not practicing on
real patients. The risk of time burden was eliminated by holding training on a normally scheduled clinical day. Consent was obtained from each of the students participating in the study and their participation in the study was voluntary. All data that was collected remained confidential. Participants were advised that they had the right to withdraw from the study at any time. Participants were given a consent form to allow the use of video recording during the simulation sessions. Confidentiality was maintained, and any identifying information was stored within a password protected computer used only by the research team.
References


Table 1

<table>
<thead>
<tr>
<th>Previous Fiber-Optic Experience</th>
<th>Fiber-Optic Scope Uses (Not Including FOI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Times used</td>
<td>0-5</td>
</tr>
<tr>
<td>Control</td>
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</tr>
<tr>
<td>Experimental</td>
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</tr>
<tr>
<td>Total</td>
<td>18 (72%)</td>
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<table>
<thead>
<tr>
<th>Fiber-Optic Intubations (Awake or Asleep)</th>
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</thead>
<tbody>
<tr>
<td>Times Performed</td>
</tr>
<tr>
<td>Control</td>
</tr>
<tr>
<td>Experimental</td>
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<tr>
<td>Total</td>
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Table 2

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<th>Mean</th>
<th>Mean Decrease</th>
<th>Sig</th>
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<td>401.00</td>
<td>241.538</td>
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<td>Intervention</td>
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<td>159.46</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 1

COMPARISON OF FIBER-OPTIC INTUBATION TIMES

- High Time
- Low Time
- Mean
- Linear (Mean)
Figure 2

**Perceived Competence Pre vs Post-Survey Scores**

- **Q.1**
- **Q.2**
- **Q.3**
- **Q.4**
- **Q.5**
- **Q.6**
- **Q.7**
- **Q.8**
- **Q.9**
- **Q.10**

![Chart showing perceived competence pre vs post-survey scores](Image)
Appendix A
Research Information Sheet

Purpose
The purpose of this study is to compare clinical competency, perceived competency, self-confidence, and satisfaction scores among nurse anesthesia students with the usual advanced airway education to students who receive an educational simulation training program on use of the fiber-optic scope during a fiber-optic intubation (FOI) scenario. In addition, competence scores will be used to make recommendations for incorporating a fiber-optic intubation into the current airway management anesthesia curriculum. The research will take place on Thursday, October 25, 2018 on South Campus in Wende Hall.

Volunteer Status
Your participation in the study is completely voluntary. Refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. You may elect to withdraw from this study at any time. If you become upset during the study, simply stop the simulation scenario and exit the lab. There will be no adverse effects on your academics by participating in this research study. You will be given the day off clinical on the day of the study should you choose to participate.

Procedure
An assessment survey will be sent to your UB email. By filling out the survey, you are consenting to participate in the research. You will be randomized into either an intervention or control group. The intervention group will receive the workshop prior to a simulated event. The control group will receive the workshop only after their participation in a scenario. The workshop portion of the study will be 120 minutes long.

Risks
There are no known risks to human subjects in this study. Protection of human rights will be maintained through coded data results, which will be secured on a password-protected device.

Benefits
Potential benefits to participation include future development of fiber-optic intubation course curriculum and increased exposure to fiber-optic intubations.

Payment
Participation is completely voluntary. There is no financial compensation rewarded for partaking in this study.

Confidentiality
The assessment survey will be sent to your UB email. By returning the assessment survey you are giving a type of verbal consent to the investigators to use your survey data for this study. By participating in the simulation scenarios, you are providing ongoing consent for participation in this project. All of your responses will be reported as aggregate of grouped data. No individual responses will be reported. If results are published or presented in public forum, your identity will not be disclosed as it not recorded in any way. Data will be kept in a locked file and the investigators are the only ones with access to this file. In order to monitor this research study, representatives from the federal agencies such as NIH and Office of Human Research protection or representatives from the UB Human Research Protections Program may inspect the research records.

For further Information
Any questions, concerns, or complaints that you may have about this study can be answered by Raymond Masters at (716) 697-4229 (masters2@buffalo.edu).

This research has been reviewed and approved by an Institutional Review Board (“IRB”). You may talk to them (anonymously, if you wish) at (716) 888-4888 or email ub-irb@buffalo.edu

By answering the questions in the assessment survey and participating in the simulation scenarios, you are consenting to participate in this research project.
Appendix B

Confidentiality of Information and Release for Still Photographs and Videotapes

Figure 1. Confidentiality of Information and Release of Videography

Figure 1. Confidentiality agreement for participant protection and to avoid information sharing between subjects. Agreement was given for use with permission by the Nurse Anesthesia department at the University at Buffalo.
Appendix C

Assessment Survey

1. What is your current status in the Nurse Anesthesia Program? (Junior or Senior?)

2. Approximately many times have you used the fiber-optic intubation scope throughout your training (including airway assessment and double lumen tube confirmation)?

3. Approximately many fiber-optic intubations have you performed (awake or asleep, not including double lumen tube confirmation)?

4. Describe how well the current airway management curriculum, that is provided in the Nurse Anesthesia Program, has prepared you to perform a fiber-optic intubation.

5. Are there any other airway skills that are high risk yet low volume on which you would like training?
Appendix D

Workshop: Fiberoptic Intubation and Simulation

Fall 2018 Workshop Outline

Contents:

1. Workshop Objectives
2. Overview of Workshop Content
3. Review of the Fiber-optic Scope and Equipment
4. Review of Fiber-optic Intubation Protocols (Awake, Asleep, Intraoral, and Intranasal)
5. Hands-on Learning Stations

1. Objectives:

This workshop will focus on the advanced airway skill of fiber-optic intubation. Participants will leave the workshop with an increased confidence and proficiency in fiber-optic intubation and use of fiber-optic equipment.

2. Overview of Workshop Content:

a. Faculty:
   Raymond Masters BSN, SRNA, Primary Researcher
   Dr. Kristine Faust DNAP, MBA, CRNA, Research Advisor

b. Timeline:

   October, 2014 (Day TBD), 0830 to 1030

   0800  Control group simulations
   1000  Introduction to course
   1010  Review of fiber-optic scope and equipment
   1040  Review indications, contraindications, and complications of FOI
   1100  Review Fiber-optic intubation protocols (awake, asleep, intraoral, and intranasal)
   1130  Hands-on learning stations and questions
   1230  Lunch Break before simulation scenarios
   1300  Intervention group simulations

3. Review of Fiber-Optic Scope and Equipment:
The PowerPoint will include an overview of the fiber-optic scope and associated equipment such as oral airways, suction, and oxygen use. The equipment will also be utilized in this lecture for a visual aid for participants.

4. Review of Fiber-optic Intubation Protocols (Awake, Asleep, Intraoral, and Intranasal)

Review of fiber-optic intubation techniques will be discussed with participants. Skills will include:

- Awake fiberoptic intubation
- Asleep fiber-optic intubation
- Intranasal and intraoral approach

5. Hands-On Learning Stations and Questions

Participants will take part in hands-on activities at two separate stations:

**Classroom Station 1:**
- Intranasal and intraoral FOI
- Proper use of associated equipment

**Patient Simulation Lab Station 2:**
- FOI practice
- Troubleshooting commonly experienced problems
- Intraoral intubating airways
Appendix E

Asleep Fiber-Optic Intubation Scenario

In this scenario the participants will perform an asleep fiber-optic intubation in the simulation lab operating room. The patient has normal airway anatomy. The operating room is set up with the mannequin, the anesthesia machine and all the necessary equipment for an asleep FOI. All participants will be evaluated using this simulation scenario.

Scenario Summary:

- 55-year-old (90kg) female requires a laparoscopic cholecystectomy.
- The patient has a history of rheumatoid arthritis and radiographic examination of the cervical spine the day before surgery revealed anterior atlantoaxial subluxation.
- The patient has a class II mallampati score, denies discomfort with head movement in all directions, a hyomental distance of 5 cm, and a mouth opening of 5 cm.
- The patient is firmly opposed to being awake for endotracheal intubation.
- The decision is made by the anesthesia team to perform an asleep fiber-optic intubation to prevent excessive neck flexion.
- The patient will be lying supine on the OR table.
- The scenario will begin after the participant has been briefed and given instructions to start.
- The scenario will end when the participant successfully intubates the patient and connects the breathing circuit to the endotracheal tube.

Learning Objectives:

1. Successfully perform a fiber-optic intubation.
2. Properly use fiber-optic intubation equipment.
3. Utilize other staff in the operating room as resources (if necessary).

Team Brief:

- Participant is given the above induction scenario and instructed to perform the fiber-optic intubation.
- Another CRNA will be present for induction. This person will be instructed to assist as directed by the participant.

Data Collection Protocol:

- The timer will start when the participant picks up the fiber-optic scope.
- The timer will stop when the participant connects the ventilator circuit to the endotracheal tube following successful intubation.
- Intubation times will be collected and analyzed.
Appendix F

Perceived Competence Survey

Please read each item and mark the number that indicates your level of confidence with each statement.

1. I feel confident in my knowledge of fiber-optic intubations.

   1 2 3 4 5 6 7
   Strongly disagree Moderately disagree Slightly disagree Neutral Slightly agree Moderately agree Strongly agree

2. I feel confident in my knowledge of the fiber-optic intubating scope.

   1 2 3 4 5 6 7
   Strongly disagree Moderately disagree Slightly disagree Neutral Slightly agree Moderately agree Strongly agree

3. I feel confident in my knowledge of awake fiber-optic intubation.

   1 2 3 4 5 6 7
   Strongly disagree Moderately disagree Slightly disagree Neutral Slightly agree Moderately agree Strongly agree

4. I feel confident in my knowledge of asleep fiber-optic intubations.

   1 2 3 4 5 6 7
   Strongly disagree Moderately disagree Slightly disagree Neutral Slightly agree Moderately agree Strongly agree

5. I feel confident in my knowledge of how to set-up the fiber-optic scope for use.

   1 2 3 4 5 6 7
   Strongly disagree Moderately disagree Slightly disagree Neutral Slightly agree Moderately agree Strongly agree
6. I feel confident in my ability to perform a fiber-optic intubation.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<tr>
<td></td>
<td>Strongly disagree</td>
<td>Moderately disagree</td>
<td>Slightly disagree</td>
<td>Neutral</td>
<td>Slightly agree</td>
<td>Moderately agree</td>
<td>Strongly agree</td>
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7. I feel confident in my ability to use the fiber-optic intubating scope.

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<th>5</th>
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<tr>
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<td>Strongly disagree</td>
<td>Moderately disagree</td>
<td>Slightly disagree</td>
<td>Neutral</td>
<td>Slightly agree</td>
<td>Moderately agree</td>
<td>Strongly agree</td>
</tr>
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</table>

8. I feel confident in my ability to perform an awake fiber-optic intubation.

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<thead>
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<th>4</th>
<th>5</th>
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<td>Moderately disagree</td>
<td>Slightly disagree</td>
<td>Neutral</td>
<td>Slightly agree</td>
<td>Moderately agree</td>
<td>Strongly agree</td>
</tr>
</tbody>
</table>

9. I feel confident in my ability to perform an asleep fiber-optic intubation.

<table>
<thead>
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<td>Neutral</td>
<td>Slightly agree</td>
<td>Moderately agree</td>
<td>Strongly agree</td>
</tr>
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</table>

10. I feel confident in my ability to set-up the fiber-optic scope for use.

<table>
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<td>Slightly disagree</td>
<td>Neutral</td>
<td>Slightly agree</td>
<td>Moderately agree</td>
<td>Strongly agree</td>
</tr>
</tbody>
</table>
Appendix G

National League of Nursing Student Self-Confidence in Learning Questionnaire

**Student Satisfaction and Self-Confidence in Learning**

**Instructions:** This questionnaire is a series of statements about your personal attitudes about the instruction you receive during your simulation activity. Each item represents a statement about your attitude toward your satisfaction with learning and self-confidence in obtaining the instruction you need. There are no right or wrong answers. You will probably agree with some of the statements and disagree with others. Please indicate your own personal feelings about each statement below by marking the numbers that best describe your attitude or beliefs. Please be truthful and describe your attitude as it really is, not what you would like for it to be. This is anonymous with the results being compiled as a group, not individually.

Mark:
1 = STRONGLY DISAGREE with the statement
2 = DISAGREE with the statement
3 = UNDECIDED - you neither agree or disagree with the statement
4 = AGREE with the statement
5 = STRONGLY AGREE with the statement

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<tr>
<th>Satisfaction with Current Learning</th>
<th>SD</th>
<th>D</th>
<th>UN</th>
<th>A</th>
<th>SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The teaching methods used in this simulation were helpful and effective.</td>
<td>0 1</td>
<td>0 2</td>
<td>0 3</td>
<td>0 4</td>
<td>0 5</td>
</tr>
<tr>
<td>2. The simulation provided me with a variety of learning materials and activities to promote my learning the airway management curriculum.</td>
<td>0 1</td>
<td>0 2</td>
<td>0 3</td>
<td>0 4</td>
<td>0 5</td>
</tr>
<tr>
<td>3. I enjoyed how my instructor taught the simulation.</td>
<td>0 1</td>
<td>0 2</td>
<td>0 3</td>
<td>0 4</td>
<td>0 5</td>
</tr>
<tr>
<td>4. The teaching materials used in this simulation were motivating and helped me to learn.</td>
<td>0 1</td>
<td>0 2</td>
<td>0 3</td>
<td>0 4</td>
<td>0 5</td>
</tr>
<tr>
<td>5. The way my instructor(s) taught the simulation was suitable to the way I learn.</td>
<td>0 1</td>
<td>0 2</td>
<td>0 3</td>
<td>0 4</td>
<td>0 5</td>
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<table>
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<th>SD</th>
<th>D</th>
<th>UN</th>
<th>A</th>
<th>SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. I am confident that I am mastering the content of the simulation activity that my instructors presented to me.</td>
<td>0 1</td>
<td>0 2</td>
<td>0 3</td>
<td>0 4</td>
<td>0 5</td>
</tr>
<tr>
<td>7. I am confident that this simulation covered critical content necessary for the mastery of airway management curriculum.</td>
<td>0 1</td>
<td>0 2</td>
<td>0 3</td>
<td>0 4</td>
<td>0 5</td>
</tr>
<tr>
<td>8. I am confident that I am developing the skills and obtaining the required knowledge from this simulation to perform necessary tasks in a clinical setting.</td>
<td>0 1</td>
<td>0 2</td>
<td>0 3</td>
<td>0 4</td>
<td>0 5</td>
</tr>
<tr>
<td>9. My instructors used helpful resources to teach the simulation.</td>
<td>0 1</td>
<td>0 2</td>
<td>0 3</td>
<td>0 4</td>
<td>0 5</td>
</tr>
<tr>
<td>10. It is my responsibility as the student to learn what I need to know from this simulation activity.</td>
<td>0 1</td>
<td>0 2</td>
<td>0 3</td>
<td>0 4</td>
<td>0 5</td>
</tr>
<tr>
<td>11. I know how to get help when I do not understand the concepts covered in the simulation.</td>
<td>0 1</td>
<td>0 2</td>
<td>0 3</td>
<td>0 4</td>
<td>0 5</td>
</tr>
<tr>
<td>12. I know how to use simulation activities to learn critical aspects of these skills.</td>
<td>0 1</td>
<td>0 2</td>
<td>0 3</td>
<td>0 4</td>
<td>0 5</td>
</tr>
<tr>
<td>13. It is the instructor's responsibility to tell me what I need to learn of the simulation activity content during class time.</td>
<td>0 1</td>
<td>0 2</td>
<td>0 3</td>
<td>0 4</td>
<td>0 5</td>
</tr>
</tbody>
</table>

© Copyright, National League for Nursing, 2005
Revised December 22, 2004
Appendix H

Dr. Pamela Jeffries Permission to Use Questionnaire

GW SON Dean Jeffries <sondean@email.gwu.edu> Thu, Jul 26, 2018 at 12:50 PM
To: Raymond Masters <masters2@buffalo.edu>
Cc: GW School of Nursing Dean Johnson GW School of Nursing Dean Johnson <sondean@gwu.edu>

Dear Raymond,

You have my permission. Thank you.

Best,

Pam

Pamela R. Jeffries PhD, RN, FAAN, ANEF
Dean and Professor of Nursing
George Washington University
School of Nursing
1919 Pennsylvania Avenue NW, Suite 500
Washington, DC 20006
Ph. 202-994-7367
e-mail pjeffries@gwu.edu

Thu, Jul 26, 2018 at 11:38 AM

Raymond Masters <masters2@buffalo.edu>
To: sondean@gwu.edu

Dr. Jeffries,

Hello, My name is Raymond Masters and I am a DNP student in the nurse anesthesia program at the University at Buffalo in Buffalo, New York. I am doing a project for nurse anesthetist students in which they will practice fiberoptic intubations on high-fidelity mannequins. My study is similar in design to the one conducted by Kelley Moore. I am hoping to use the NLN's Student Satisfaction and Self-Confidence in Learning questionnaire for the participants in this research project. I would like permission to use the questionnaire and to change the wording in question numbers two and seven from "medical surgical" to "airway management."

2) The simulation provided me with a variety of learning materials and activities to promote my learning in the airway management curriculum

7) I am confident that this simulation covered critical content necessary for the mastery of airway management curriculum.

I am officially requesting permission to use this questionnaire in my capstone project and for permission for the wording change in these two questions.

Thank you for your time,

Raymond Masters, BSN, SRNA

masters2@buffalo.edu
Appendix I

APPROVAL OF SUBMISSION

October 3, 2018

Dear RAYMOND MASTERS:

On 10/3/2018, the IRB reviewed the following submission:

<table>
<thead>
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<th>Type of Review:</th>
<th>Initial Study</th>
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<tbody>
<tr>
<td>Title of Study:</td>
<td>Fiber-Optic Intubation Educational Workshop and Clinical Competence: an Experimental Study</td>
</tr>
<tr>
<td>Investigator:</td>
<td>RAYMOND MASTERS</td>
</tr>
<tr>
<td>IRB ID:</td>
<td>STUDY00002784</td>
</tr>
<tr>
<td>Funding:</td>
<td>None</td>
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<tr>
<td>Grant ID:</td>
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<tr>
<td>IND, IDE, or HDE:</td>
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Documents Reviewed:
- Confidentiality of Information Contract, Category: Other;
- Volunteer Email Recruitment Script, Category: Recruitment Materials;
- Perceived Competence Survey, Category: Surveys/Questionnaires;
- HRP-503-Template Fiber-Optic Intubation Education Experimental Study, Category: IRB Protocol;
- Roles and Responsibilities Volunteers, Category: Other;
- Research Information Sheet Volunteers, Category: Consent Form;
- Asleep Fiber-Optic Intubation Scenario, Category: Other;
- Volunteer Survey, Category: Surveys/Questionnaires;
- Assessment Survey, Category: Surveys/Questionnaires;
- Permission from Dr. Jeffries, Category: Other;
- Workshop Outline, Category: Other;
- Research Recruitment Script, Category: Recruitment Materials;
- Volunteer Recruitment Script, Category: Recruitment Materials;
- NLN Questionnaire, Category: Surveys/Questionnaires;
- Research Information Email Script, Category: Recruitment Materials;
- Research Information Sheet, Category: Consent Form;

The IRB approved the study from 10/3/2018 to 10/2/2019 inclusive. Before 10/2/2019 or within 30 days of study closure, whichever is earlier, you are to submit a continuing review with required explanations.
If continuing review approval is not granted before the expiration date of 10/2/2019, approval of this study expires on that date. The Initial Study materials for the project referenced above were reviewed and approved by the SUNY University at Buffalo IRB (UBIRB) by expedited review. Before 10/2/2019 or within 30 days of study closure, whichever is earlier, you are to submit a continuing review with required explanations. You can submit a continuing review by navigating to the active study and clicking Create Modification / CR.

Studies cannot be conducted beyond the expiration date without re-approval by the UBIRB.

In conducting this study, you are required to follow the requirements listed in the Investigator Manual (HRP-103), which can be found by navigating to the IRB Library within the IRB system.

UB IRB approval is given with the understanding that the most recently approved procedures will be followed and the most recently approved consenting documents will be used. If modifications are needed, those changes may not be initiated until such modifications have been submitted to the UBIRB for review and have been granted approval.

Prior to the expiration of this approval, you will receive notification that it is time for the UBIRB to conduct its periodic review of your study. Studies cannot be conducted beyond expiration date without re-approval by the UBIRB.

As principal investigator for this study involving human participants, you have responsibilities to the SUNY University at Buffalo IRB (UBIRB) as follows:

1. Ensuring that no subjects are enrolled prior to the IRB approval date.

2. Ensuring that the study is not conducted beyond the expiration date without re-approval by the UBIRB.

3. Ensuring that the UBIRB is notified of:
   - All Reportable Information in accordance with the Reportable New Information Form Smart Form.
   - Project closure/completion by the Continuing Review/Modification/ Study Closure smart form.

4. Ensuring that the protocol is followed as approved by UBIRB unless a protocol amendment is prospectively approved.

5. Ensuring that changes in research procedures, recruitment or consent processes are not initiated without prior UBIRB review and approval, except where necessary to eliminate apparent immediate hazards to subjects.

6. Ensuring that the study is conducted in compliance with all UBIRB decisions, conditions, and requirements.

7. Bearing responsibility for all actions of the staff and sub-investigators with regard to the protocol.
8. Bearing responsibility for securing any other required approvals before research begins. If you have any questions, please contact the UBIRB at 716-888-4888 or ub-irb@buffalo.edu.
Oral Defense Poster Presentation

Fiber-Optic Intubation Workshop and Clinical Competence: An Experimental Study
Raymond Masters, BSN, RN, SRNA, DNP-C

Introduction
- Fiber-optic intubation (FOI) is the gold standard for management of intubation or predicted difficult airways.
- Traditionally, anesthetists learn most of their airway management skills inside the operating room, but exposure to high-risk, low-volume skills such as FOI are unpredictable.
- FOI experience is unpredictable and there is potential that nurse anesthesia (RNA) students will be unprepared to effectively use this equipment upon graduation.
- Literature suggests that simulation is an appropriate learning method for techniques such as fiber-optic intubation.

Objectives
The purpose of this study is to compare clinical competence, perceived competence, self-confidence, and satisfaction scores with FOI among RNA students with the usual advanced airway education, to students who receive an educational simulation training program on FOI equipment and technique using a FOI scenario.

Methods
An experimental design was chosen to assess clinical competence. After obtaining voluntary consent, second and third-year (n = 25) RNA students were randomized into control and experimental groups. The experimental group participated in a FOI workshop and simulation which took place at the NYS School of nursing. The control group received only the usual airway management education lecture provided in the RNA curriculum. Both groups were then evaluated during a FOI scenario using timed intubations to measure competence. Perceived competence, self-confidence, and satisfaction scores were also evaluated using self-rating questionnaires.

Workshop
- Participants were provided with a 50-minute lecture on FOI equipment, procedure, associated equipment and technique, and with hands-on learning stations.

Assessment of FOI Scenario
- All subjects were pre-briefed on the patient and situation.
- A FOI scenario was performed in the simulation lab using a high-fidelity mannequin and a volunteeer (passing RNAH) to evaluate competence.

Design and Instruments
- Competence was measured using timed FOI. Participants were timed from picking up the scope to successful intubation and connecting the breathing circuit. An independent t-test was used to analyze differences between the control and experimental groups.
- Perceived competence was measured using a ten question self-assessment survey given pre and post-intervention. This survey uses a seven-point Likert score with higher scores indicating higher perceived competence levels and lower scores indicating lower levels. Descriptive statistics were used to evaluate the differences between the pre and post-test scores.
- Self-confidence and satisfaction were measured using a modified version of the National League for Nursing (NLN) Student Satisfaction and Self-confidence in Learning Questionnaire which consists of 13 self-report statements. This survey is designed for pre-training use only. The minimum score, maximum score, and SD were analyzed.

Participant responses regarding previous fiber-optic experience and education were also collected. Table 1

Data Analysis
Data were analyzed using Microsoft Excel and Statistical Package for the Social Sciences (SPSS).

Results
Table 1

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<th>Group</th>
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<th>Mean</th>
<th>SD</th>
<th>T-value</th>
<th>p-value</th>
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<td>Experimental</td>
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Table 2

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<th>SD</th>
<th>T-value</th>
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Table 3

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<th>SD</th>
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<td>2.0</td>
<td>2.5</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Conclusion
- Participant levels of competence, perceived competence, self-confidence, and satisfaction were all found to improve following an educational FOI workshop.
- Increased competence with FOI among RNA students could potentially decrease adverse outcomes among difficult airway patients after graduation.
- This workshop could be a beneficial addition to the RNA curriculum at UB.
- More research should be conducted evaluating long-term benefits of the workshop.

References
Available upon request.

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