Marian University

Leighton School of Nursing

Doctor of Nursing Practice

Final Project Report for Students Graduating in May 2022

INACSL Simulation-Based Training for Bag-Mask Ventilation

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Dedication

I believe that through deep practice, anyone can master skills that at one time seemed out of reach to them. The use of high-fidelity simulation within Nurse Anesthesia education is one such manner that an individual can harness the power of deep practice to improve their skill. First and foremost, at the beginning of deep practice, one must understand that skill you are trying to improve. For this reason, I chose to develop a simulation experience to enhance the understanding of the most foundational skill in anesthesia, being Bag-Mask Ventilation. I struggled with this skill initially and hope that others may struggle less than I did through this education. With that, I dedicate this project to those anesthesia students that come after me. I hope that what I have developed might be of some value to you in your educational journey. This DNP project is dedicated to my loving wife, Dr. Amy Wotring. She has been an unfailing source of love and support. This DNP project is dedicated to my mother, Dr. Debbie Wotring, who believed in me at a young age when no one else did and taught me the importance of deep work. Thank you.

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I want to express my gratitude to my Chair Dr. Stelflug for helping me develop this project and encouraging me to pursue my passion for using simulation in Nurse Anesthesia education. I want to say thank you to my Committee Member Dr. Pepin, who has kindly guided me through this project while surviving a barrage of late-night emails and odd-hour phone calls. I could not have asked for a better team to mentor me throughout this process.

Abstract

Background and Review of Literature: The ability to manage a patient's airway is a critical skill an anesthesia provider must possess. Poor airway management can result in inadequate ventilation, which can lead to brain damage and death. Simulation training in anesthesia providers' education is an effective and safe way to allow providers to improve technical and nontechnical skills without putting patients at risk. INACSL standards of best practice provide a way to standardize health care simulation to optimize and enhance simulation-based learning.

Purpose: This DNP project was a quality improvement project to examine the effect on SRNA knowledge, satisfaction with learning, and confidence in their ability to adequately ventilate a patient via bag-mask ventilation when using simulation-based training that incorporates INACSL best practices compared to current simulation-based training.

Methods: This DNP project utilized a quality improvement design and was evaluated by the Student Satisfaction and Self-Confidence in Learning instrument and a post-test knowledge assessment.

Implementation Plan/Procedure: A total of 24 SRNA's enrolled in an anesthesia simulation course were divided into 2 groups. Group 1 had been intended to receive standard practices of self-directed learning of BMV skills, while Group 2 received a 2:1 hands-on instructional activity during the prebrief period. Both groups underwent the same simulation checkoff for BMV skills. Both groups were given a pre-test and post-test of the Student Satisfaction and Self-Confidence in Learning instrument. Additionally, both groups also completed a post-test knowledge assessment after the simulation checkoff.

Implications/Conclusion: Overall, the participants in the experimental group consistently scored higher in agreement in the satisfaction ($U = 15.5$, $p = .001$) and self-confidence of student learning (U= 16.0, p=.001). Moreover, they scored higher percentages in the knowledge section despite the individuals in the control group having additional undue outside influence during this project. If simulation is used, INACSL best practice standards should be incorporated. This will allow nurse anesthesia educational programs to implement more effective BMV training within their program, which will improve the safety of their care.

Keywords: BMV, SRNA, CRNA, Simulation, INACSL, Jeffries Simulation Model

INACSL Simulation-Based Training for Bag-Mask Ventilation

This project is submitted to Marian University Leighton School of Nursing faculty as partial fulfillment of degree requirements for the Doctor of Nursing Practice, Certified Registered Nurse Anesthetist track. Successfully bag-mask ventilating a patient is one of the most critical skills a new anesthesia provider can learn. Upon entering clinical practice, a new student registered nurse anesthetist (SRNA) will encounter different providers who will use various bag-mask ventilation (BMV) techniques. The use of simulation allows a secure environment for new SRNA's to practice technical skills, such as bag-mask ventilation, without the ability to cause patient harm before entering the clinical setting (Wunder, 2016). Furthermore, using simulation training, SRNA's can be trained on how to appropriately handle high-stress, low-frequency events that are taught didactically, which students may rarely encounter during their clinical practicum (Wunder, 2016). With the emergence of COVID-19, it is recommended that providers use anesthetic techniques that either eliminate or minimize the use of bag-mask ventilation, resulting in bag-mask ventilating an anesthetized patient to become a high-stress, low-frequency event (Orser, 2020).

Current simulation-based training, utilized at Marian University, to teach the first-year SRNAs bag-mask ventilation may not meet the identified objectives of increased knowledge and confidence in the ability of the SRNA to adequately bag-mask ventilate a patient (INACSL Standards Committee, 2016). However, SRNA's can benefit from simulation-based training using the International Nursing Association for Clinical Simulation and Learning's (INACSL) best practice standards to fulfill identified purposes before entering the clinical arena. For INACSL best practice standards can improve students' ability to adequately bag-mask ventilate a patient, and knowledge on how to do so will provide SRNA students with a firm foundation to build off when encountering different bag-mask ventilation techniques.

Background

Simulation training in anesthesia providers' education is effective and safe to allow providers to improve technical and nontechnical skills without putting patients at risk (Yunoki & Sakai, 2018). The Council of Accreditation, the accrediting body for nurse anesthetist programs, has highlighted the value of using simulation in nurse anesthesia education (Council on Accreditation, 2020). Since the late 1960s, simulation training has been used in medical education in the form of mannequins and standardized patients (Yunoki & Sakai, 2018). With anesthesia being a specialty that requires hands-on training, training via simulation is particularly beneficial for this specialty (Wiggins et al., 2018; Yunoki & Sakai, 2018). Anesthesia providers must master a variety of skills before entering clinical practice, and the use of simulation training has shown to be effective in teaching clinical skills to a level that has led to success in the clinical environment (Wiggins et al., 2018; Yunoki & Sakai, 2018).

The ability to manage a patient's airway is a critical skill an anesthesia provider must possess. Poor airway management can result in inadequate ventilation, which can lead to brain damage and death. A closed-claims analysis of anesthesia-related deaths and brain damage revealed that 28% of these claims occurred due to inadequate ventilation (Komatsu et al., 2010). With bag-mask ventilation being the most foundational skill in airway management and one of the most challenging skills to execute appropriately, it is a skill that is essential for anesthesia providers to master (Wittels, 2019).

In recent years, there has been a drastic expansion of clinical understanding and knowledge, thus creating a rising demand for healthcare professionals to use evidence-based practice (Meum et al., 2020). This increase in knowledge has led to increased simulation use in nursing education to help students apply classroom knowledge in clinical situations (Meum et al., 2020). There is a rising level of evidence demonstrating that simulation effectively teaches procedural skills and clinical expertise (Meum et al., 2020). Furthermore, simulation has been shown to increase learners' critical thinking, confidence, psychomotor skills, and knowledge acquisition for educational purposes (Meum et al., 2020).

INACSL standards of best practice provide a way to standardize health care simulation to optimize and enhance simulation-based learning. INACSL has developed nine best-practice standards that offer recommendations and strategies for developing simulations (Sittner et al., 2015). Using these best-practice standards ensures the simulation can provide the value gained from simulation-based education. The INACSL best-practice standards incorporate knowledge gained from adult learning theories, simulation pedagogy, clinical standards of care, education, evaluation, and instructional design (INACSL Standards Committee, 2016). Using these best-practice standards in developing simulation-based training for bag-mask ventilation will improve learner outcomes and provide a solid foundation to continue to build off upon entering the clinical arena (INACSL Standards Committee, 2016).

Problem Statement

SRNA's are adult learners that are entering into anesthesia practice. As new anesthesia providers, SRNA's need to develop strong airway management skills, specifically the skill of bag-mask ventilation (Komatsu et al., 2010). This Doctor of Nursing Practice project was a quality improvement project to examine the effect on SRNA knowledge, satisfaction with learning, and confidence in their ability to adequately ventilate a patient via bag-mask ventilation when using simulation-based training that incorporates INACSL best practices compared to current simulation-based training.

Gap Analysis

Currently, at Marian University, simulation training of bag-mask ventilation does not meet INACSL's best practices. For current practice, SRNA students are provided with reading materials and allowed open lab time to practice BMV skills in a self-directed manner. There is no use of high-fidelity simulation during the skill practice or real-time feedback by a faculty member. INACSL standards of best practice state that part of the facilitator's role, which is absent in the current practice, is to impart knowledge and confidence into the student to maximize the educational effectiveness of the simulation (Sittner et al., 2015). Additionally, the Council of Accreditation underscores that simulation helps develop critical thinking skills and apply these skills while enabling experiential learning during the education of SRNAs (Council on Accreditation, 2020).

Review of Literature

A review of the literature was completed to address the population, intervention, comparison, and outcomes (PICO) question, "Does simulation-based training using INACSL best practices increase SRNA knowledge, satisfaction with learning, and confidence in their ability to adequately ventilate a patient via bag-mask ventilation compared to current simulation-based training?" The following electronic databases were used: Academic Search Premier, Alt Health Watch, Biomedical Reference Collection: Basic, CINAHL, ERIC, Health Business, Health Source: Nursing/Academic Edition, MEDLINE, and Middle Search Plus. The search was conducted with phrases and the following keywords in combination: *simulat**; *bag-mask ventilation*; *BMV*; *bag valve mask*; *nursing education*; *nurse education*; *continuing education*;

training program; *training*; *nursing instruction*; *nurse anesthetist*; *anesthetist*; *CRNA*; and *nurse anesthesia*. Any article that was not scholarly peer-reviewed, published in the last five years (2015-2020), and available in English were excluded. For a journal article to be included within this literature review, the article must have exhibited relevance to simulation training of either nurses or anesthesia providers while assessing for improved knowledge, confidence, and ability due to the simulation training. All articles that did not meet specified criteria and were not about simulation were excluded.

This search criterion found 193 articles related to the PICO question, of which 154 titles and abstracts were screened. Twenty-five full articles were reviewed, and seven were selected based on the most significant clinical relevance to the PICO question for this review of the literature. Please see Appendix A to view the literature review matrix. The articles found in this literature review can be broken down into the following two categories: high-fidelity simulation-based BMV training and high-fidelity simulation-based training for SRNAs.

High-Fidelity Simulation-Based BMV Training

Three articles were found that addressed BMV training in a high-fidelity simulation environment (Mumma et al., 2018; Pastis et al., 2019; Pearlman et al., 2016). The use of high-fidelity simulation-based training has been shown to be applicable to teaching bag-mask ventilation (Pastis et al., 2019). Training novice providers on BMV using high-fidelity simulation-based training is more successful than training providers with simulations where low-fidelity simulation feedback is given ($p = 0.02$) (Mumma et al., 2018). Providers trained using high-fidelity simulation performed more efficient BMV post-training ($p = 0.002$) while reporting higher confidence levels compared to those providers trained initially on patients ($p = 0.039$) (Pastis et al., 2019).

When providers perform BMV on patients in the hospital setting, they use various visual feedback signals, for example, fog in the mask and chest rise, and electronic vital signs, such as end-tidal carbon dioxide and pulse oximetry, to assess adequacy (Mumma et al., 2018). By monitoring these cues, providers can adjust techniques to provide better BMV. Clinicians that are experts are superior to novice clinicians at recognizing these visual feedback signals when electronic vital signs are not available ($p = 0.05$) (Mumma et al., 2018). Novice clinicians rely more on automated technology during high-stress situations than experts ($p = 0.02$) (Mumma et al., 2018). When vital signs, given during high-fidelity simulation compared to low-fidelity simulation, have been removed from view, novice clinicians cannot maintain adequate BMV during the simulation as well as experienced clinicians ($p = 0.02$) (Mumma et al., 2018). When more electronic feedback was provided, such as that provided during high-fidelity simulation, the difference between novice and experienced clinicians' ability to correctly perform BMV was diminished ($p = 0.01$) (Mumma et al., 2018).

The fidelity of a simulation impacts the efficacy of the simulation. In the simulation training of BMV, high fidelity simulation is the most effective form (Pearlman et al., 2016). For the simulation to be effective and for the clinician to achieve aptitude in the skill intended to be trained during the simulation, it must be similar to the real-life event that the clinician will experience. Therefore, high-fidelity simulation should be designed to be as similar as possible to a real-life situation (Pearlman et al., 2016). Giving credit to the use of high-fidelity simulation in training novice clinicians with an improved educational experience before caring for a patient in a high-stress situation (Pearlman et al., 2016).

High-Fidelity Simulation-Based Training for SRNAs

Four articles were found that addressed high-fidelity simulation-based training for SRNAs (Bradford & Cook, 2015; Erlinger et al., 2019; Lambert, 2015; Parsons et al., 2019). High-fidelity simulation-based training for SRNA's can improve student education and performance in the clinical environment (Lambert, 2015; Parsons et al., 2019). Benefits for SRNAs using simulation training include the students engaging in specific scenarios as critical thinking exercises while incorporating technical skills (Lambert, 2015; Parsons et al., 2019). Simultaneously, facilitators of simulations can allow errors to occur that would typically require intervention without putting patients in danger (Lambert, 2015; Parsons et al., 2019). High-fidelity simulation is an effective means to develop SRNAs' critical thinking skills and clinical knowledge through being able to simulate events that are infrequent and would otherwise take years to acquire due to this infrequency (Bradford & Cook, 2015; Parsons et al., 2019). This benefit is seen explicitly in SRNAs with less experience, where high-fidelity simulation is more effective than other simulation modes ($p = 0.01$) (Erlinger et al., 2019). In contrast, SRNAs with more significant clinical experience showed no benefit of using high-fidelity simulation than other forms of simulation. As evidence by students with more significant clinical experience having no change in the amount of time required to recognize critical intraoperative events when using high-fidelity simulation compared to other forms of simulation, ($p = 0.6762$) (Erlinger et al., 2019).

Literature Review Conclusion

High-fidelity simulation training for BMV is an excellent option in training novice SRNAs and is well supported by the Council of Accreditation for CRNA programs. It gives the trainee the clinical feedback of both visual and electronic cues needed to improve their learning technique. Even if simulation alone cannot prepare a clinician comprehensively, training appropriate BMV techniques in a high-fidelity simulation environment allows the learner to practice technique without harming a patient (Pastis et al., 2019; Pearlman et al., 2016; Council on Accreditation, 2020).

Theoretical Framework

This project's theoretical framework is the Jeffries Simulation Model. Jeffries published an article in 2005 entitled "A Framework for Designing, Implementing, and Evaluating Simulations Used as Teaching Strategies in Nursing," that described the major components in the design, evaluation, and implementation of simulation-based education (Groom et al., 2014; Jeffries et al., 2015). The model was developed to better combine clinical expertise with simulation as a teaching method (Groom et al., 2014; Jeffries et al., 2015). There are five major components identified in the framework: *Teacher Factors*, *Student Factors*, *Educational Practices*, *Simulation Design Characteristics*, and *Outcomes* (Jeffries, 2005). Please see Appendix B for a pictural representation of Jeffries's simulation model.

Jeffries defines teachers as those who support the learner throughout the simulation, and *Teacher Factors* as the familiarity and preparation that the individuals have with the simulation they are running (Jeffries, 2005). This component is relevant to developing the simulation in this project, with the teacher being the individual running the simulation. *Student Factors* are defined as the student's ability to be driven and self-directed during the simulation training (Jeffries, 2005). This is pertinent to this project for SRNAs are a motivated and self-determined group of individuals pursuing an advanced practice graduate degree.

Educational Practices should be aimed at using principles that result in student learning and satisfaction (Jeffries, 2005). Jefferies (2005), highlights utilizing active learning principles, feedback, student-faculty interaction, collaborative learning, high expectations, diverse learning, and time on task during simulation training, all of which will be incorporated in the design and implementation of this project. *Simulation Design Characteristics* insinuate that the simulation needs to support the simulation's goals and learning outcomes (Jeffries, 2005). This is done by having guiding principles in the simulation design with clearly written objectives, a fidelity, and complexity of the simulation that matches the appropriate clinical context, and debriefing upon completion of the simulation to ensure adequate learning (Jeffries, 2005). These will be guiding principles in the design of this project's simulation.

Jefferies defines *Outcomes* as the simulation's ability to impart knowledge retained for longer than knowledge gained through lecture alone, improved performance of procedural skills, increased learner satisfaction, critical thinking, and self-confidence (Jeffries, 2005). All of which applies to this project, for they are part of this simulation's goals. Used in combination, these five major components identified in the Jeffries Simulation Model framework are beneficial for this project, for they outline how to develop a simulation effectively.

Goals, Objectives, and Expected Outcomes

This DNP project's objective is to give first-year SRNAs high-quality, high-fidelity simulation-based training for BMV that enhances their knowledge and confidence in their ability to perform BMV. The project's specific aims are to enhance first-year SRNAs' knowledge of BMV, confidence in their ability to bag-mask ventilate a patient, and satisfaction with learning. This will demonstrate that those SRNAs who participate in the improved BMV simulation have higher post-test knowledge assessment scores, confidence interval scores, and satisfaction with learning than those who complete the currently used simulation training. This project's expected outcome is improved learning using INACSL best practice for simulation-based training for BMV, compared to simulation-based training for BMV that does not use INACSL best practices.

Project Design

This DNP project utilizes a quality improvement design to update the current standard simulation-based training for BMV utilized at Marian University to simulation-based training for BMV utilizing INACSL best practices. This quality improvement project was evaluated by a confidence interval and satisfaction with learning pre-test, a confidence interval and satisfaction with learning post-test, and a knowledge assessment post-test.

Project Site and Sample

The site for this project's intervention was Marian University's high-fidelity simulation lab. Marian University has a Nurse Anesthesia program that has been accredited by the Council of Accreditation, with currently twenty-four SRNA students per cohort. Upon completing this program, graduates are awarded a Doctor of Nursing Practice degree and can take the national board certification exam to become certified registered nurse anesthetists (CRNA). The high-fidelity simulation lab at Marian University is a complete operating room, allowing the SRNA students to have a life-like simulation to prepare them to become a CRNA. These factors make the high-fidelity simulation lab at Marian University an ideal location to complete this quality improvement project.

This project utilized a convenience sample of first-year SRNAs at Marian University. Students included in this project were first-year SRNA students enrolled in the first anesthesia principles simulation course at Marian University. Students who were not enrolled in this course were excluded from data collection.

Methods

Before developing this quality improvement project, an exemption was obtained from Marian University's Institutional Review Board (IRB), after which the educational intervention curriculum for the experimental group was developed. This curriculum was developed by reviewing the topic BMV in textbooks that are used by Marian's nurse anesthesia program. Two textbooks were explicitly used to develop this curriculum being *Nurse Anesthesia, 6th ed.* (Nagelhout & Sass, 2018) and *Clinical Anesthesia, 8th ed.* (Barash, 2017). Upon reviewing these textbooks, the author developed an outline based upon the author's own experience in clinical practice on what to teach. This project's chair established the validity of the content in the outline. For Dr. Bradley Stelflug, a Doctorly Prepared Nurse Anesthetist, is both an expert in nurse anesthetist education, being a nurse anesthetist program director, and nurse anesthesia, being a practicing CRNA since 1998. To see the outline used during the intervention, please see Appendix C.

Each of the first-year Marian SRNAs was randomly assigned to either the experimental or control group, with half of the class being in each group for a total of 12 students in the control group and 12 students in the experimental group. Both groups before either simulation experience received assigned readings as preparatory work and a checkoff sheet that would be used by course faculty to assess the student's ability to perform BMV adequately. After the students completed the assigned preparatory work, each student completed the measurement instrument pre-test for this project administered via Qualtrics. The control group was intended to receive the current simulation-based training for BMV utilized at Marian University to educate first-year SRNAs. This current simulation experience had consisted of the assigned readings as preparatory work and the checkoff sheet to guide a self-led simulation experience using low-fidelity mannequins during open simulation lab time.

In contrast, the experimental group received simulation-based training for BMV that utilizes INACSL best practices for simulation-based learning. The topics covered in the outline were reviewed in a structured manner, with each topic first being demonstrated by the author and then repeated back by each participant while receiving direct feedback. The author delivered this educational experience to students in groups of two over 40 minutes while utilizing high-fidelity simulation equipment. The students in the experimental group were allowed to sign up for these 40-minute time slots in groups of their choosing to receive the improved simulation experience. At least 48 hours after the scheduled completion time of either the control groups or the experimental groups' intended simulation experience, there was a checkoff administered by the course faculty to assess the student's ability to adequately BMV. After completing the faculty administered checkoff, each student completed the measurement instrument post-test for this project administered via Qualtrics.

Measurement Instrument

One of the measurement instruments used in this project is a tool to test satisfaction and self-confidence in learning named the Student Satisfaction and Self-Confidence in Learning, which was administered as a pre-test and post-test. The other measurement instrument that was administered was a knowledge assessment post-test. A set of demographics questions were administered during the pre-test survey to ascertain any differences between the control and experimental groups. The demographics questions included age, sex, and years of experience working as a registered nurse. Semester or year within the SRNA program was not included as all potential participants were from the same cohort. Please see Appendix D to view the demographics questions. There was also a free text survey question administered during the post-test that asked the students to describe their bag-mask ventilation simulation experience. This free text question was included to add value to the overall understanding of the student experience allowing the students to express anything that might not have been captured within the measurement instrument. All pre-test, post-test, and free text questions were administered anonymously via a Qualtrics survey sent to the SRNAs school email.

Satisfaction and Confidence Interval

The National League for Nursing's Student Satisfaction and Self-Confidence in Learning instrument that was administered as a pre-test and post-test to measure student satisfaction and confidence in learning is a 13-question test using a 5-point Likert scale where the response options ranged from a 5 = Strongly agree to a 1 = Strongly disagree. Out of the 13 questions, the first five of the questions were to measure the student's satisfaction with learning whereas the second eight questions measure the student's self-confidence in learning. To measure the student's satisfaction, the average scores of the five satisfaction questions are totaled, with a range of 5 to 25, and to measure the student's overall self-confidence in learning, the second eight questions are totaled and then average with a range of 8 to 40. The content validity of this instrument has been established with an internal reliability for the satisfaction questions (Cronbach's alpha) of 0.94 and for the self-confidence questions 0.87 (NLN, n.d.). The Student Satisfaction and Self-Confidence in Learning instrument was then modified to be better relevant and appropriately apply to the purpose of this quality improvement project. Please see Appendix E to view the original Student Satisfaction and Self-Confidence instrument. Please see Appendix F to view the modified Student Satisfaction and Self-Confidence instrument used for this quality improvement project.

Knowledge Assessment

The knowledge assessment post-test used five questions developed to assess the SRNAs' practical application of bag-mask ventilation. These questions consisted of one multiple correct response and four multiple choice questions. The topics of the knowledge assessment questions include identifying factors to predict difficulty with BMV, how to appropriately BMV, how to assess the adequacy of BMV, and how to improve patient positioning during BMV. These questions were developed based on the curriculum provided during the students' nurse anesthesia education, specifically utilizing *Nurse Anesthesia, 6th ed.* (Nagelhout & Sass, 2018), and *Clinical Anesthesia, 8th ed.* (Barash, 2017). The content validity of these questions was established by reliance on three Doctorly Prepared Nurse Anesthetists that are content experts. Please see Appendix G to view the knowledge assessment post-test questions utilized.

Data Collection

The DNP student collected all data for this project via Qualtrics surveys sent to the project participants' student email. The pre-test data that was collected via Qualtrics survey was sent to the students' email the weekend before the intended simulation intervention that was to be completed, after receiving the assigned preparatory readings and the course faculty checkoff sheet. The post-test data was collected via Qualtrics survey that was sent to the students' email upon completion of the faculty administered checkoff. Students were given three days to complete the post-test data collection. All responses were kept confidential and anonymous via Qualtrics.

Ethical Considerations

Marian University's IRB approval for this project was received on February 1st, 2021, with this project being deemed exempt. Please see Appendix H to view the IRB approval letter.

Confidentiality pertaining all survey responses was ensured via the use of Qualtrics to administer the surveys. By having Qualtrics send anonymous survey emails to the participants' student email, no personal information was collected. With only general demographics, free text response, and relevant data from the instrument tools being collected.

The data collected was from the initial demographics survey, the modified Student Satisfaction and Self-Confidence interval pre-test, the modified Student Satisfaction and Self-Confidence interval post-test, the knowledge assessment post-test, and the free text survey. All responses were confidential.

Analysis

The data were analyzed using descriptive statistics, including measures of frequency, central tendency measures, and variability measures. All categorical and numerical data were evaluated in frequency tables. Frequencies and percentages were calculated for questions in the survey that were categorical variables. Mean, median, range, and standard deviation were calculated for questions with continuous variables (Field, 2013). Thematic analysis was used to analyze free-text questions. After running tests for normality, the data was found to not be equally distributed; hence inferential statistics such as Mann-Whitney U test were used to detect group differences (Field, 2013). IBM SPSS Statistics (Version 27) was used to perform all statistical analyses.

Results

A total of 24 first-year Marian SRNAs were eligible and participated in this study. Half of the students were randomly assigned to the control group, whereas the other half were randomly assigned to the experimental group. All students completed the survey twice within a week period (100% return rate). All young adult respondents were first-year Marian SRNA students. Most respondents (75%) were between the ages of 25-34, identified as female (67%), and have been working as a registered nurse for at least 4 years (79%). Please see Table 1 to view the demographics of all survey respondents.

Table 1

Demographics and Characteristics of All Survey Respondents

Characteristics	n	%
Gender		
Female	16	66.7
Male	8	33.3
Age Group		
18-24 years	0	0.0
25-34 years	18	75.0
35-44 years	4	16.6
45-54 years	1	4.2
55-64 years	1	4.2
Years Working as a Registered Nurse		
1-3 years	5	20.8
4-6 years	10	41.7
7-11 years	7	29.2
12+ years	2	8.3

Note. n=24

Satisfaction and Self-Confidence with Current Learning

Questions one through five on the questionnaire were specifically measuring overall satisfaction with current learning. Questions six through thirteen on the questionnaire were specifically measuring self-confidence with current learning. All questions were analyzed separately by their reported levels of agreement and compared amongst groups. Please see Appendix I to view Tables 8-22.

Control Group Overall Satisfaction with Current Learning (Pre and Post-Test)

To determine satisfaction with current learning, the student's reported levels of satisfaction on a 5-point scale that ranged from 1 to 5. Students in the control group completed the same questionnaire twice. A Mann Whitney U test results indicated that those in the pre-test control group were less satisfied with current learning (Mdn=3.4 range 1.8-4.8) than those in the post-test control group (Mdn=4.0, range 2.4-5.0). This difference in satisfaction was not statistically significant (U= 47.0, p=.143). The only individual question that was statistically significant was, "The teaching methods used in this simulation were helpful and effective." See Table 2 for satisfaction results.

Table 2

Control Group Results of 5-Items to Measure Satisfaction with Current Learning (Post-Test)

Item	Control Group Pre-Test Mean (SD)	Control Group Post-Test Mean (SD)	Mean Difference	p-Value
Satisfaction 1	3.17 (0.84)	3.92 (0.90)	+0.75	0.046*
Satisfaction 2	3.50 (0.91)	3.50 (0.91)	0.00	1.000
Satisfaction 3	3.08 (1.08)	3.75 (0.87)	+0.67	0.121
Satisfaction 4	3.33 (1.12)	3.92 (0.90)	+0.59	0.203
Satisfaction 5	3.25 (1.14)	3.75 (1.14)	+0.50	0.255
Summed Satisfaction	16.33 (4.66)	18.83 (4.09)	+2.50	0.143

**Note.* Using Mann Whitney U test, statistically significant change at $p < 0.05$.

Control Group Overall Self-Confidence in Learning (Pre and Post-Test)

To determine self-confidence in learning, student's reported levels of satisfaction on a 5-point scale that ranged from 1 to 5. A Mann-Whitney U test results indicated that those in the post-test control group had overall more self-confidence in learning (Mdn=4.0, range 2.8-4.6) than those in the pre-test control group (Mdn=3.8, range 2.6-4.4). However, this difference in self-confidence was not statistically significant (U= 60.0, p=.485). Additionally, all individual items in the subscale were not statistically significant. See Table 3 for satisfaction results.

Table 3

Control Group Results of 8-Items to Measure Self-Confidence in Current Learning (Post-Test)

Item	Control Group Pre-Test Mean (SD)	Control Group Post-Test Mean (SD)	Mean Difference	p-Value
Self-Confidence 6	3.50 (0.67)	3.75 (0.75)	+0.25	0.331
Self-Confidence 7	3.33 (0.78)	3.83 (0.39)	+0.50	0.070
Self-Confidence 8	3.50 (0.91)	3.67 (0.79)	+0.17	0.656
Self-Confidence 9	3.33 (1.16)	3.75 (0.87)	+0.42	0.419
Self-Confidence 10	3.75 (0.97)	3.83 (1.27)	+0.08	0.618
Self-Confidence 11	4.33 (0.49)	4.33 (0.49)	+0.00	1.000
Self-Confidence 12	4.17 (0.72)	4.00 (0.83)	-0.17	0.701
Self-Confidence 13	4.25 (0.45)	4.17 (0.58)	-0.08	0.743
Summed Confidence	30.17 (4.28)	31.33 (4.29)	+1.16	0.485

**Note.* Using Mann Whitney U test, statistically significant change at $p < 0.05$.

Experimental Group Overall Satisfaction with Current Learning (Pre and Post-Test)

To determine satisfaction with current learning, student's reported levels of satisfaction on a 5-point scale that ranged from 1 to 5. Students in the experimental group completed the same questionnaire twice. A Mann-Whitney U test results indicated that those in the pre-test control group were less satisfied with current learning (Mdn=3.9 range 2.0-5.0) than those in the post-test control group (Mdn=4.9, range 4.2-5.0). This difference in satisfaction was statistically significant (U= 15.5, p=.001). Additionally, all individual items in the subscale were statistically significant. See Table 4 for satisfaction results.

Table 4

Experimental Group Results of 5-Items to Measure Satisfaction with Current Learning (Post-Test)

Item	Experimental Group Pre-Test Mean (SD)	Experimental Group Post-Test Mean (SD)	Mean Difference	p-Value
Satisfaction 1	3.83 (0.84)	4.67 (0.49)	+0.84	0.008*
Satisfaction 2	3.67 (0.78)	4.67 (0.49)	+1.00	0.002*
Satisfaction 3	3.58 (0.79)	4.75 (0.45)	+1.17	0.001*
Satisfaction 4	3.42 (0.90)	4.67 (0.49)	+1.25	0.001*
Satisfaction 5	3.58 (0.79)	4.67 (0.49)	+1.09	0.001*
Summed Satisfaction	18.08 (3.90)	23.42 (2.07)	+5.34	0.001*

**Note.* Using Mann Whitney U test, statistically significant change at $p < 0.05$.

Experimental Group Overall Self-Confidence in Learning (Pre and Post-Test)

To determine self-confidence in learning, student's reported levels of satisfaction on a 5-point scale that ranged from 1 to 5. The Mann Whitney U test results indicated that those in the post-test control group had overall more self-confidence in learning (Mdn=4.9, range 4.0-5.0) than those in the pre-test control group (Mdn=3.9 range 2.9-5.0). This difference in self-confidence was statistically significant ($U= 16.0$, $p=.001$). In addition to the summed values, six individual items in the subscale were statistically significant. See Table 5 for satisfaction results.

Table 5

Experimental Group Results of 8-Items to Measure Self-Confidence in Current Learning (Post-Test)

Item	Experimental Group Pre-Test Mean (SD)	Experimental Group Post-Test Mean (SD)	Mean Difference	p-Value
Self-Confidence 6	3.58 (0.79)	4.67 (0.49)	+1.09	0.001*
Self-Confidence 7	3.75 (0.62)	4.67 (0.49)	+0.92	0.002*
Self-Confidence 8	3.67 (0.79)	4.75 (0.45)	+1.08	0.001*
Self-Confidence 9	3.58 (0.79)	4.67 (0.49)	+1.09	0.001*
Self-Confidence 10	4.33 (0.65)	4.83 (0.39)	+0.50	0.035*
Self-Confidence 11	4.33 (0.49)	4.75 (0.45)	+0.42	0.089
Self-Confidence 12	3.92 (0.79)	4.58 (0.52)	+0.66	0.023*
Self-Confidence 13	4.08 (0.70)	4.58 (0.52)	+0.50	0.062
Summed Confidence	31.25 (4.28)	37.50 (3.09)	+6.25	0.001*

**Note.* Using Mann Whitney U test, statistically significant change at $p < 0.05$.

Both Groups Overall Satisfaction with Current Learning (Post-Test)

To determine if satisfaction with current learning differed in a statistically significant way, student's reported levels of satisfaction on a 5-point scale that ranged from 1 to 5. The results of a Mann Whitney U test indicated that those in the post-test experimental group were more satisfied with current learning (Mdn=4.9, range 4.0-5.0) than those in the post-test control group (Mdn=4.0, range 2.4-5.0). This difference in satisfaction was statistically significant ($U = 21.0$, $p = .003$). In addition to the summed values, all individual items in the subscale were statistically significant. See Table 6 for satisfaction results.

Table 6

Both Groups Results of 5-Items to Measure Satisfaction with Current Learning (Post-Test)

Item	Control Group Mean (SD)	Experimental Group Mean (SD)	Mean Difference	p-Value
Satisfaction 1	3.92 (0.90)	4.67 (0.49)	+0.75	0.023*
Satisfaction 2	3.50 (0.91)	4.67 (0.49)	+1.17	0.001*
Satisfaction 3	3.75 (0.87)	4.75 (0.45)	+1.00	0.003*
Satisfaction 4	3.92 (0.90)	4.67 (0.49)	+0.75	0.023*
Satisfaction 5	3.75 (1.14)	4.67 (0.49)	+0.92	0.023*
Summed Satisfaction	18.83 (4.09)	23.42 (2.07)	+4.59	0.003*

**Note.* Using Mann Whitney U test, statistically significant change at $p < 0.05$.

Both Groups Overall Self-Confidence in Learning (Post-Test)

To determine if self-confidence in learning differed in a statistically significant way, student's reported levels of satisfaction on a 5-point scale that ranged from 1 to 5. The Mann Whitney U test results indicated that those in the post-test experimental group had overall more self-confidence in learning (Mdn=4.9, range 4.0-5.0) than those in the post-test control group (Mdn=4.0 range 2.8-4.6). This difference in self-confidence was statistically significant ($U = 16.0$, $p = .001$). In addition to the summed values, six individual items in the subscale were statistically significant. See Table 7 for satisfaction results.

Table 7

Both Groups Results of 8-Items to Measure Self-Confidence in Learning (Post-Test)

Item	Control Group Mean (SD)	Experimental Group Mean (SD)	Mean Difference	p-Value
Self-Confidence 6	3.75 (0.75)	4.67 (0.49)	+0.92	0.002*
Self-Confidence 7	3.83 (0.39)	4.67 (0.49)	+0.84	0.001*
Self-Confidence 8	3.67 (0.79)	4.75 (0.45)	+1.08	0.001*
Self-Confidence 9	3.75 (0.87)	4.67 (0.49)	+0.92	0.006*
Self-Confidence 10	3.83 (1.27)	4.83 (0.39)	+1.00	0.011*
Self-Confidence 11	4.33 (0.49)	4.75 (0.45)	+0.42	0.045*
Self-Confidence 12	4.00 (0.83)	4.58 (0.52)	+0.58	0.062
Self-Confidence 13	4.17 (0.58)	4.58 (0.52)	+0.41	0.081
Summed Confidence	31.33 (4.29)	37.50 (3.09)	+6.17	0.001*

**Note.* Using Mann Whitney U test, statistically significant change at $p < 0.05$.

Both Groups Knowledge Assessment (Post-Test)

Students were given a five-question knowledge-post-test on BMV. These questions included single-response and select-all-that-apply multiple-choice formats. The control group scored a mean overall knowledge score of 61.7% (SD = 19.92), while the experimental group had a mean score of 66.7% (SD = 15.57). This result was not significant (U= 63.0, p=.571). When each question is evaluated individually, none of the questions showed statistically significant differences. Full statistical results of factors that have been identified as predictors for difficulty with BMV can be found in Tables 21 & 22 in Appendix I.

Description of Experience with BMV

The post-test ended by allowing students to share their experience via a free text survey with the question prompt being, '*In your own words, how would you describe the experience of the bag-mask ventilation simulation?*' In the control group specifically, students viewed the preparation as very independent and offered several suggestions for improvement. Suggestions included going through a difficult BMV situation and having more scenario-based situations similar to what is shown in clinical. Students enjoyed practicing BMV with CO2 tracings and the ability to practice BMV with high-fidelity simulation. Several students in the control group commented on the learning experience as being helpful and beneficial. One student commented:

> *"The simulation is especially a short one. I found it beneficial to be able to practice the concepts hands on the mannequin while receiving feedback on my technique."*

Negative comments from participants in the control group included not receiving enough education prior to BMV checkoff and preparation being very independently directed. One student commented:

> *"The simulation test out was not nearly as informative as [faculty] demonstration nor the one provided for the DNP project scenario. [Faculty] provided a good example of how to escalate when unable to achieve ventilation. The test out involved very little to no instruction in comparison, but with some emphasis on different strap possibilities. And the DNP project simulation I found provided the best physical demonstration and educational opportunity to learn the basics of the physical skill to achieve best ventilation."*

In the experimental group, students viewed the intervention as an informative, helpful, and great experience. Students enjoyed the supervision and guidance, the learning environment being better than the readings alone, and the helpful techniques and advice given. One student commented:

> *"I absolutely loved the interactive teaching and learning experience. I was taken through the process step by step and asked to then go over it by myself, so the teaching was reinforced once I saw how it should be done and given a chance to practice on my own."*

Another student in the experimental group wrote:

"I was able to gauge a better understanding of the concept of bag mask ventilation. Prior to simulation, I was going through the motions without understanding the rationale behind each step. After working with [DNP Student], I developed a foundational understanding of techniques. Thank you, [DNP Student]."

Summary

A total of 24 SRNA's participated in the pre and post-test, providing a completion rate of 100% (24/24). There was not a significant difference in the control group's responses in the pre and post-test for satisfaction with current learning (U= 47.0, p=.143) and self-confidence in learning (U= 60.0, p=.485). For the experimental group pre and post-test responses, results were statistically significant for satisfaction with current learning (U= 15.5, p=.001) and self-confidence in learning (U= 16.0, p=.001). Overall, participants in the experimental group had a more positive experience than those in the control group and had higher averages in the questions asked. For the overall satisfaction with current learning, the mean increased from an 18.08 to a 23.43 for the experimental group (U= 15.5, p=.001). For the overall self-confidence in learning, the mean increased from a 31.24 to a 37.50 for the post-test (U= 21.0, p=.003).

Discussion

The need for new SRNA's entering into clinical practice to be able to successfully BMV an anesthetized patient is a foundational skill for being a safe practitioner. Using high-fidelity simulation that follows INACSL best practices can successfully give SRNA's a foundational understanding on how to appropriately BMV. Due to COVID-19, the opportunities to practice BMV during clinical have been minimized; hence, the use of high-fidelity simulation can help bridge the gap in knowledge that this has created. The importance of being able to successfully BMV a patient can be captured by a quote one clinical instructor stated: "if you can ventilate, you can graduate." Therefore, the purpose of this study was to provide SRNA students foundational knowledge and understanding on how to practically BMV an anesthetized patient. According to the PICO question, the goal of this Doctoral of Nursing Practice project was to examine the effect on SRNA knowledge, satisfaction with learning, and confidence in their ability to ventilate a patient via bag-mask ventilation adequately

Discussion of Findings

The SRNAs that participated in the experimental group had improved satisfaction with learning methods compared to those individuals in the control group. Scores for SRNAs in the experimental group improved from 18.1 to 23.4 ($U= 15.5$, $p=.001$). This underlines the overall improved satisfaction that those participants had with the additional education. Further, the SRNAs that participated in the experimental group had improved self-confidence in learning compared to those individuals in the control group. With those SRNAs in the control group scoring 31.3 in the post-test compared to 37.5 in the experimental group ($U= 21.0$, $p=.003$), this underlines the overall improved self-confidence that those participants had with the additional education. Differences in these scores may be reflective of the fact that those SRNAs in the experimental group received improved education on the topics, which increased their confidence. One thing to note is that for self-confidence in learning questions number 12 and 13, the control group had negative growth in self-confidence from their pre-test to post-test, with those SRNAs in the control group scoring 4.17 in the pre-test compared to 4.00 in the post-test for self-confidence in learning question number 12 ($p=0.701$) and scoring 4.25 in the pre-test compared to 4.17 in the post-test for self-confidence in learning question number 13 ($p=0.743$). This could be because students in the control group became less confident in their abilities to use simulation effectively to learn BMV and felt it was less of the instructor's responsibility to tell the students what they need to learn. This may result from the lack of structured education that the participants in the control group underwent between taking the pre-test and post-test questionnaires.

Overall, SRNA participants in the experimental group had slightly better scores in a few sections of the knowledge assessment test. SRNAs in the experimental group scored better on the knowledge assessment questions pertaining to evidence of adequate ventilation during BMV. However, in the achievement of proper BMV, only 16.7% of both groups selected the correct answer. Likewise, for the final knowledge assessment question about the factors identified as predictors for difficulty with BMV, both groups scored similarly, with the average percent correct being 83%. Collectively, the control group scored a mean overall knowledge score of 61.7% (SD = 19.92), while the experimental group had a mean score of 66.7% (SD = 15.57) (U= 63.0, p=.571). When each question was evaluated individually, none of the questions showed statistically significant differences. Reasons for this could be that students in the control group received outside help from clinical faculty and upper-level students. This can be used as further evidence that even if a student has the knowledge of how to perform a skill appropriately this does not mean that the student will have the confidence in their ability to perform the skill—highlighting the need for structured education with return demonstration by SRNAs when learning a new clinical skill, such as was completed by the experimental group.

Strengths and Limitations

There were several limitations to the project. The first limitation was the sampling method for this study used a convenience sample of Marian SRNA students. This limited the ability to generalize the results of the data to the population of SRNAs as a whole at other universities. The small sample size was an additional limitation, for it hindered the ability to run parametric statistics. Another limitation was the restriction on the number of students being allowed on campus at a time or within small vicinity's. However, this limitation was resolved by scheduling students in the experimental group in small groups of two at assigned times to go through their simulation-based training.

The final limitation would be that those students in the control group received outside influence from upperclassman in the program and course faculty that they should not have received if this was to be Marian's original simulation education for BMV. The control group did not receive the intended current simulation-based training for BMV that had been used previously to educate first-year SRNAs but received a modified version by having unstructured simulation instruction by faculty and upper-level students for BMV during what had previously been a self-led experience using low-fidelity mannequins during open simulation lab time. This is evidenced by some of the student comments in the control group highlighted above, discussing how faculty instruction was more instructive than the checkoff. This extra instruction is a limitation for the project, for it did not have the control group that was intended. However, this extra instruction that the control group received unintended within the parameters of this project actually strengthens the results for this project showing that structured instruction is more beneficial than unstructured education for SRNA students pertaining to BMV.

Conclusion

Overall, the participants in the experimental group consistently scored higher in agreement in the satisfaction and self-confidence of student learning. Moreover, they scored higher percentages in the knowledge section despite the individuals in the control group had additional undue outside influence during this project. Students in the experimental group furthermore expressed more positive remarks than those in the control group about overall satisfaction with the learning intervention.

The topics covered during the knowledge-based assessment of BMV are essential information that SRNA's must know to be safe and successful in their future clinical practice. Research regarding BMV training of SRNAs should be conducted to further add to the body of literature in order for best practices regarding BMV training to be established. If simulation is used, INACSL best practice standards should be incorporated. This will allow CRNA educational programs to better implement BMV training within their program. Improving SRNA's ability to adequately BMV their patients will allow them to provide improved safety of care.

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Appendix A

Literature Review Matrix

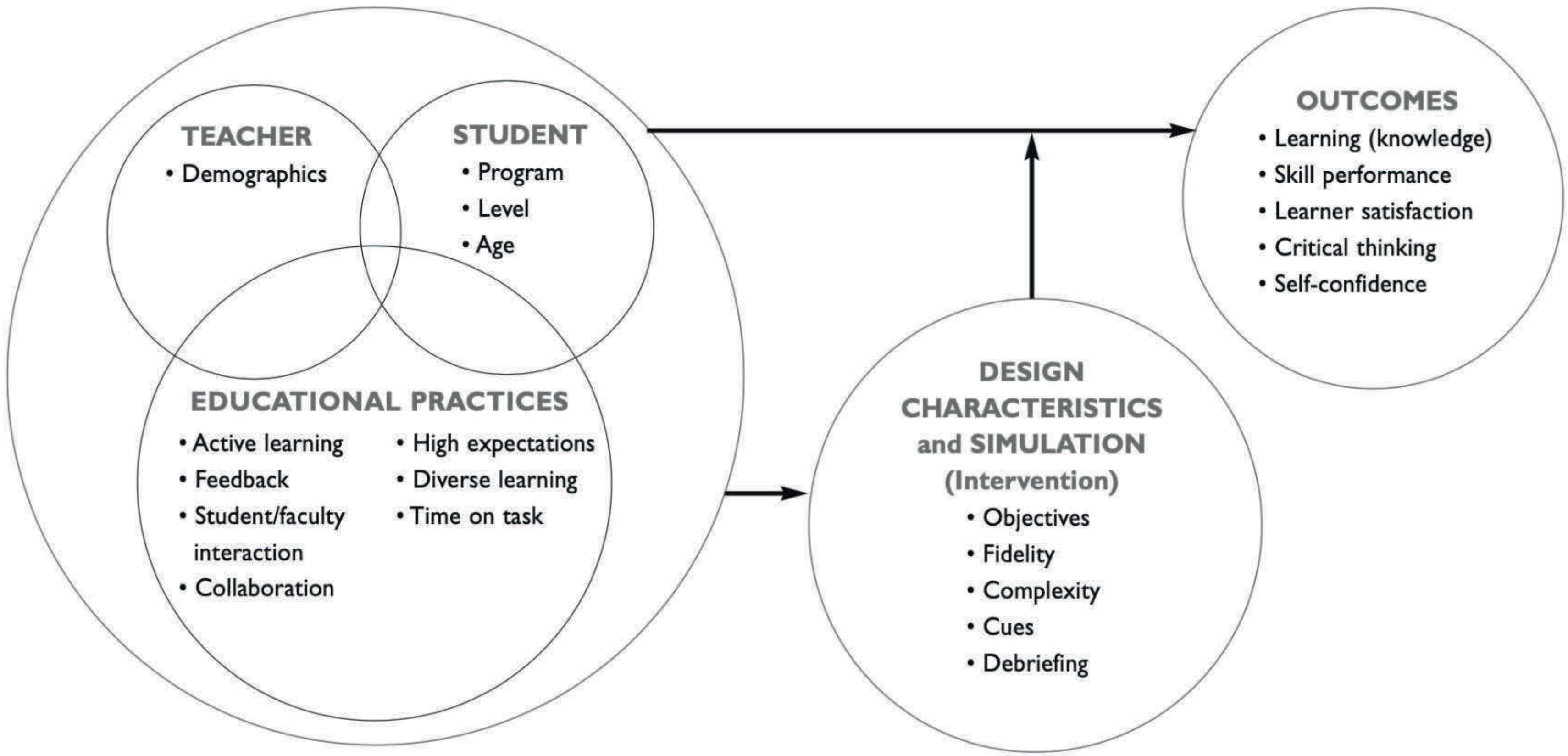
Reference (APA)	Level of Evidence	Research Question	Variables	Sample	Instruments	Results
Bradford & Cook, 2015	Level III: Quasi-experimental research design	How does high-fidelity simulation influence critical thinking skills in SRNA students.	The independent variable was the high-fidelity simulation. The dependent variable were the pre-simulation and post-simulation test scores.	The sample consisted of 16 SRNA students.	Data was collected via a pre-simulation and post-simulation questionnaire.	High-fidelity simulation training resulted in improved post-simulation test scores.
Erlinger et al., 2019	Level II: Randomized Control Trial	What is the difference in learning between the second and third-year SRNA students using high fidelity and virtual simulation	The independent variable is the high-fidelity simulation and virtual simulation. The dependent variable is the second and third-year SRNA students.	Nineteen second-year SRNA students and twenty-third-year SRNA students.	Data collection was completed on the time it took the SRNA student to identify the adverse event during the simulation.	The second-year SRNA students took longer to identify the adverse event using the virtual simulation than the high-fidelity simulation. There was no significant difference in time for the third-year SRNA student to recognize the adverse event between the high-fidelity simulation and the virtual simulation ($p = 0.6762$).
Lambert, 2015	Level VI: Single Descriptive Study, Case Report	Not applicable.	The dependent variable was a high-fidelity simulation.	Three first-year SRNA students.	No data was collected.	A case report on a simulation done with three first-year SRNA students, with the results being how the students responded to the high-fidelity simulation.

Appendix A cont.

Reference (APA)	Level of Evidence	Research Question	Variables	Sample	Instruments	Results
Mumma et al., 2018	Level II: Randomized Control Trial	Examine the effects of high-fidelity simulation on providers of varying experience.	The independent variable is the high-fidelity simulation. The dependent variable is the level of experience of the provider performing BMV.	Six experts and six novice respiratory therapists.	Data collection was completed using video recordings of gaze, ventilation rate, and think-aloud protocol.	Experts relied on patient observation, not automation, as the primary source of information. At the same time, novices showed a bias in using automated technology.
Parsons et al., 2019	Level V: Quality Improvement project	The impact of high-fidelity simulation in training providers for low-frequency, high-impact events.	The independent variable is the high-fidelity simulation. The dependent variable were the pre-intervention test scores and post-intervention test scores.	Sixteen CRNAs volunteered to participate.	A fifteen-question survey instrument developed by the principal investigators was used, along with a five-point Likert scale and a Key Action Checklist that measured technical skills performance.	High-fidelity simulation training resulted in improved self-confidence, knowledge, and technical skills performance.
Pastis et al., 2019	Level II: Randomized Control Trial	What is the outcome difference using high-fidelity simulation training for BMV compared to training BMV on patients.	The independent variable is the high-fidelity simulation, and the dependent variable is BMV performance and confidence levels.	Thirty-two medical students.	The primary data collected was the rate of passing on the post-test patients. With secondary data being simulator post-test scores, pre-test confidence scores, and post-test confidence scores.	The medical students who received bag-mask ventilation training using the high-fidelity simulation performed better post-test bag-mask ventilation performance and had higher confidence levels than those trained on patients.
Pearlman et al., 2016	Level II: Randomized Control Trial	What is the efficacy of BMV skills in providers of different levels of experience, and the impact of different feedback mechanisms	The independent variable is the high-fidelity simulation. The dependent variable is the provider's performance of BMV.	The sample consisted of five medical residents, five neonatal nurse practitioners, five neonatal-perinatal fellows, and five neonatologists.	The data collected were various performance measures about the ability to adequately BMV.	The greater the provider's experience correlated inversely with the amount of feedback needed to perform BMV effectively.

Appendix B:

Jeffries Simulation Model



"Jeffries Simulation Model," by P. R. Jeffries, 2005, *Nursing Education Perspectives*, *26*(2), 96–103. (https://journals.lww.com/neponline/pages/articleviewer.aspx?year=2005&issue=03000&article=00009&type=abstract)

Appendix C

Outline for Experimental Group Simulation Education

- Identification of Difficult Bag-Mask Ventilation
    - Beard
    - Obese
    - No Teeth
    - Elderly
    - Short Thyromental distance/Snoring
    - Worse Mallampati III >> II
- Appropriate Size Mask
- How to hold the mask
    - Use of E-O vs. E-C Technique
    - Placement of Hands
        - Left Thumb/Index around the collar
        - Left Side to face with Palm
        - Middle/Ring under Mandible
        - 5th Finger under the Maxilla
    - Head Tilt/Chin Lift
    - Chin Rock on expiration
- How to Ventilate
    - 1 Breath every 5-6 seconds
    - Deliver breath over 1 second
    - Airway pressures less than 20-25 cm H_2O
- Confirmation of Adequate Ventilation
    - Condensation
    - Spirometric Reading
    - Chest Rise
    - Maintenance of Oxygen saturation
    - Breath Sounds
- Ways to optimize Ventilation
    - OA
    - NA
    - HOB elevated
    - Two-Handed Ventilation

Appendix D

Demographics Questionnaire

Q1 What date are you scheduled to do your simulation?

- ○ Wednesday, March 24th
- ○ Friday, March 26th

Q2 How old are you?

- ○ 18-24 years old
- ○ 25-34 years old
- ○ 35-44 years old
- ○ 45-54 years old
- ○ 55-64 years old
- ○ 65+ years old

Q3 How do you describe yourself?

- ○ Male
- ○ Female
- ○ Non-binary / third gender
- ○ Other
- ○ Prefer not to say

Q4 How many years have you been working as a Registered Nurse:

- ○ 1-3
- ○ 4-6
- ○ 7-11
- ○ 12+

Appendix E

Student Satisfaction and Self-Confidence in Learning

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

Satisfaction with Current Learning	SD	D	UN	A	SA
1. The teaching methods used in this simulation were helpful and effective.	O 1	O 2	O 3	O 4	O 5
2. The simulation provided me with a variety of learning materials and activities to promote my learning the medical surgical curriculum.	O 1	O 2	O 3	O 4	O 5
3. I enjoyed how my instructor taught the simulation.	O 1	O 2	O 3	O 4	O 5
4. The teaching materials used in this simulation were motivating and helped me to learn.	O 1	O 2	O 3	O 4	O 5
5. The way my instructor(s) taught the simulation was suitable to the way I learn.	O 1	O 2	O 3	O 4	O 5

Appendix E cont.

Self-confidence in Learning	SD	D	UN	A	SA
6. I am confident that I am mastering the content of the simulation activity that my instructors presented to me.	O 1	O 2	O 3	O 4	O 5
7. I am confident that this simulation covered critical content necessary for the mastery of medical surgical curriculum.	O 1	O 2	O 3	O 4	O 5
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	O 1	O 2	O 3	O 4	O 5
9. My instructors used helpful resources to teach the simulation.	O 1	O 2	O 3	O 4	O 5
10. It is my responsibility as the student to learn what I need to know from this simulation activity.	O 1	O 2	O 3	O 4	O 5
11. I know how to get help when I do not understand the concepts covered in the simulation.	O 1	O 2	O 3	O 4	O 5
12. I know how to use simulation activities to learn critical aspects of these skills.	O 1	O 2	O 3	O 4	O 5
13. It is the instructor's responsibility to tell me what I need to learn of the simulation activity content during class time..	O 1	O 2	O 3	O 4	O 5

 Revised December 22, 2004

Appendix F

Modified Student Satisfaction and Self-Confidence in Learning

Q1 The teaching methods used in this simulation were helpful and effective.

	Strongly disagree	Disagree	Undecided- neither agree or disagree	Agree	Strongly agree
How would rate the above statement:	○	○	○	○	○

Q2 The simulation provided me with a variety of learning materials and activities to promote my learning within the Certified Registered Nurse Anesthetist curriculum.

	Strongly disagree	Disagree	Undecided- neither agree or disagree	Agree	Strongly agree
How would rate the above statement:	○	○	○	○	○

Q3 I enjoyed how I was taught the simulation.

	Strongly disagree	Disagree	Undecided- neither agree or disagree	Agree	Strongly agree
How would rate the above statement:	○	○	○	○	○

Q4 The teaching materials used in this simulation were motivating and helped me to learn.

	Strongly disagree	Disagree	Undecided- neither agree or disagree	Agree	Strongly agree
How would rate the above statement:	○	○	○	○	○

Q5 The way the simulation was taught was suitable to the way I learn.

	Strongly disagree	Disagree	Undecided- neither agree or disagree	Agree	Strongly agree
How would rate the above statement:	○	○	○	○	○

Q6 I am confident that I am mastering the content of the simulation activity that my instructors presented to me.

	Strongly disagree	Disagree	Undecided- neither agree or disagree	Agree	Strongly Agree
How would rate the above statement:	○	○	○	○	○

Q7 I am confident that this simulation covered critical content necessary for the mastery of bag-mask ventilating a patient.

	Strongly disagree	Disagree	Undecided- neither agree or disagree	Agree	Strongly agree
How would rate the above statement:	○	○	○	○	○

Appendix F cont.

Q8 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

	Strongly disagree	Disagree	Undecided- neither agree or disagree	Agree	Strongly agree
How would rate the above statement:	○	○	○	○	○

Q9 My instructors used helpful resources to teach the simulation.

	Strongly disagree	Disagree	Undecided- neither agree or disagree	Agree	Strongly agree
How would rate the above statement:	○	○	○	○	○

Q10 It is my responsibility as the student to learn what I need to know from this simulation activity.

	Strongly disagree	Disagree	Undecided- neither agree or disagree	Agree	Strongly agree
How would rate the above statement:	○	○	○	○	○

Q11 I know how to get help when I do not understand the concepts covered in the simulation.

	Strongly disagree	Disagree	Undecided- neither agree or disagree	Agree	Strongly agree
How would rate the above statement:	○	○	○	○	○

Q12 I know how to use simulation activities to learn critical aspects of these skills

	Strongly disagree	Disagree	Undecided- neither agree or disagree	Agree	Strongly agree
How would rate the above statement:	○	○	○	○	○

Q13 It is the instructor's responsibility to tell me what I need to learn of the simulation activity content during class time.

	Strongly disagree	Disagree	Undecided- neither agree or disagree	Agree	Strongly agree
How would rate the above statement:	○	○	○	○	○

Appendix G

Knowledge Assessment Questionnaire

1. Factors that have been identified as predictors for difficulty with bag-mask ventilation (BMV), choose four:
    - Age greater than 55
    - Age younger than 12
    - No teeth
    - Short interincisor distance
    - Mallampati score of III
    - Mallampati of II
    - Short thyromental distance
    - Long thyromental distance
2. Adequate ventilation during BMV is evidence by:
    a. Lack of condensation
    b. Presence of adequate spirometric reading
    c. Reduced or absent breath sounds
    d. A decreasing oxygen saturation
3. Bag-mask ventilation should not require an airway pressure more than:
    a. 10-15 cm H2O
    b. 15-20 cm H2O
    c. 20-25 cm H2O
    d. 25-30 cm H2O
4. If difficulty is believed to be a possibility with BMV, positioning can be improved by:
    a. Raising the bed
    b. Lowering the bed
    c. Placing the bed in Trendelenburg
    d. Placing the bed in head up position
5. Proper BMV can be achieved by all of the following except:
    a. Placing the left thumb and index finger around the collar of the facemask at both the mask bridge and chin curve
    b. Compressing the left side of the mask onto the face with the palm of the left hand.
    c. The middle and ring finger are placed on the bony part of the mandible to help compress the mask to the patients face
    d. The fifth finger can be placed at the angle of the maxilla to provide a jaw-thrusting maneuver.

Appendix H

IRB Exemption Form

MARIAN UNIVERSITY
Indianapolis ®

Institutional Review Board

DATE:	02-01-2021
TO:	Spencer B. Wotring
FROM:	Institutional Review Board
RE:	IRB #S21.210
TITLE:	INACSL Simulation-Based Training for Bag-Mask Ventilation
SUBMISSION TYPE:	New Project
ACTION:	Determination of Exempt Status
DECISION DATE:	02-01-2021

The Institutional Review Board at Marian University has reviewed your protocol and has determined the procedures proposed are appropriate for exemption under the federal regulations. As such, there will be no further review of your protocol and you are cleared to proceed with your project. The protocol will remain on file with the Marian University IRB as a matter of record. Please be mindful of the importance of reporting only de-identified, HIPAA-compliant information about the patient in any exhibit or publication.

Although researchers for exempt studies are not required to complete online CITI training for research involving human subjects, the IRB **recommends** that they do so, particularly as a learning exercise in the case of student researchers. Information on CITI training can be found on the IRB's website: http://www.marian.edu/academics/institutional-review-board.

It is the responsibility of the PI (and, if applicable, the faculty supervisor) to inform the IRB if the procedures presented in this protocol are to be modified or if problems related to human research participants arise in connection with this project. Any procedural modifications must be evaluated by the IRB before being implemented, as some modifications may change the review status of this project. Please contact me if you are unsure whether your proposed modification requires review. Proposed modifications should be addressed in writing to the IRB. **Please reference the above IRB protocol number in any communication to the IRB regarding this project.**

Amanda C. Egan, Ph.D.
Chair, Marian University Institutional Review Board

Appendix I

Table 8

Helpfulness of Teaching Methods Used in Stimulation

Helpfulness of Teaching Methods	n	%
Pre-Test Control Group		
Strongly Disagree	0	0.0
Disagree	3	25.0
Undecided	4	33.3
Agree	5	41.7
Strongly Agree	0	0.0
Post-Test Control Group		
Strongly Disagree	0	0.0
Disagree	1	8.3
Undecided	2	16.7
Agree	6	50.0
Strongly Agree	3	25.0
Pre-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	1	8.3
Undecided	2	16.7
Agree	7	58.3
Strongly Agree	2	16.7
Post-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	0	0.0
Undecided	0	0.0
Agree	4	33.3
Strongly Agree	8	66.7

Note. n=12

Appendix I cont.

Table 9

Promotion of Learning within the CRNA Curriculum through the Learning Materials and Activities Provided by the Simulation

Promotion of Learning	n	%
Pre-Test Control Group		
Strongly Disagree	0	0.0
Disagree	2	16.7
Undecided	3	25.0
Agree	6	50.0
Strongly Agree	1	8.3
Post-Test Control Group		
Strongly Disagree	0	0.0
Disagree	2	16.7
Undecided	3	25.0
Agree	6	50.0
Strongly Agree	1	8.3
Pre-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	1	8.3
Undecided	3	25.0
Agree	7	58.3
Strongly Agree	1	8.3
Post-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	0	0.0
Undecided	0	0.0
Agree	4	33.3
Strongly Agree	8	66.7

Note. n=12

Appendix I cont.

Table 10

Enjoyment of Simulation Teaching Methods

Enjoyment of Simulation Teaching Methods	n	%
Pre-Test Control Group		
Strongly Disagree	0	0.0
Disagree	5	41.7
Undecided	2	16.7
Agree	4	33.3
Strongly Agree	1	8.3
Post-Test Control Group		
Strongly Disagree	0	0.0
Disagree	1	8.3
Undecided	3	25.0
Agree	6	50.0
Strongly Agree	2	16.7
Pre-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	1	8.3
Undecided	4	33.3
Agree	6	50.0
Strongly Agree	1	8.3
Post-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	0	0.0
Undecided	0	0.0
Agree	3	25.0
Strongly Agree	9	75.0

Note. n=12

Appendix I cont.

Table 11

Teaching Materials in Simulation Were Motivating and Helped Students Learn

Motivating and Helpful	n	%
Pre-Test Control Group		
Strongly Disagree	1	8.3
Disagree	2	16.7
Undecided	2	16.7
Agree	6	50.0
Strongly Agree	1	8.3
Post-Test Control Group		
Strongly Disagree	0	0.0
Disagree	1	8.3
Undecided	2	16.7
Agree	6	50.0
Strongly Agree	3	25.0
Pre-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	2	16.7
Undecided	4	33.3
Agree	5	41.7
Strongly Agree	1	8.3
Post-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	0	0.0
Undecided	0	0.0
Agree	4	33.3
Strongly Agree	8	66.7

Note. n=12

Appendix I cont.

Table 12

Simulation Teaching Methods Suitable to Learning Style

Simulation Teaching Methods Suitable to Learning Style	n	%
Pre-Test Control Group		
Strongly Disagree	0	0.0
Disagree	5	41.7
Undecided	0	0.0
Agree	6	50.0
Strongly Agree	1	8.3
Post-Test Control Group		
Strongly Disagree	0	0.0
Disagree	3	25.0
Undecided	0	0.0
Agree	6	50.0
Strongly Agree	3	25.0
Pre-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	1	8.3
Undecided	4	33.3
Agree	6	50.0
Strongly Agree	1	8.3
Post-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	0	0.0
Undecided	0	0.0
Agree	4	33.3
Strongly Agree	8	66.7

Note. n=12

Appendix I cont.

Table 13

Confidence in Mastering the Content of the Simulation Activity

Confidence in Mastering the Content of the Simulation Activity	n	%
Pre-Test Control Group		
Strongly Disagree	0	0.0
Disagree	1	8.3
Undecided	4	33.3
Agree	7	58.3
Strongly Agree	0	0.0
Post-Test Control Group		
Strongly Disagree	0	0.0
Disagree	1	8.3
Undecided	2	16.7
Agree	8	66.7
Strongly Agree	1	8.3
Pre-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	1	8.3
Undecided	4	33.3
Agree	6	50.0
Strongly Agree	1	8.3
Post-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	0	0.0
Undecided	0	0.0
Agree	4	33.3
Strongly Agree	8	66.7

Note. n=12

Appendix I cont.

Table 14

Confidence that the Simulation Covered Critical Content

Confidence that Simulation Covered Critical Content	n	%
Pre-Test Control Group		
Strongly Disagree	0	0.0
Disagree	2	16.7
Undecided	4	33.3
Agree	6	50.0
Strongly Agree	0	0.0
Post-Test Control Group		
Strongly Disagree	0	0.0
Disagree	0	0.0
Undecided	2	16.7
Agree	10	83.3
Strongly Agree	0	0.0
Pre-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	0	0.0
Undecided	4	33.3
Agree	7	58.3
Strongly Agree	1	8.3
Post-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	0	0.0
Undecided	0	0.0
Agree	4	33.3
Strongly Agree	8	66.7

Note. n=12

Appendix I cont.

Table 15

Confidence in Developing the Skills and Obtaining the Knowledge from the Simulation to Perform Necessary Tasks in a Clinical Setting

Confidence in Developing Skills and Obtaining Knowledge	n	%
Pre-Test Control Group		
Strongly Disagree	0	0.0
Disagree	2	16.7
Undecided	3	25.0
Agree	6	50.0
Strongly Agree	1	8.3
Post-Test Control Group		
Strongly Disagree	0	0.0
Disagree	1	8.3
Undecided	3	25.0
Agree	7	58.3
Strongly Agree	1	8.3
Pre-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	1	8.3
Undecided	3	25.0
Agree	7	58.3
Strongly Agree	1	8.3
Post-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	0	0.0
Undecided	0	0.0
Agree	3	25.0
Strongly Agree	9	75.0

Note. n=12

Appendix I cont.

Table 16

Helpfulness of Resources Instructors Used to Teach Simulation

Helpfulness of Resources Instructors Used to Teach Simulation	n	%
Pre-Test Control Group		
Strongly Disagree	1	8.3
Disagree	2	16.7
Undecided	2	16.7
Agree	6	50.0
Strongly Agree	1	8.3
Post-Test Control Group		
Strongly Disagree	0	0.0
Disagree	1	8.3
Undecided	3	25.0
Agree	6	50.0
Strongly Agree	2	16.7
Pre-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	1	8.3
Undecided	4	33.3
Agree	6	50.0
Strongly Agree	1	8.3
Post-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	0	0.0
Undecided	0	0.0
Agree	4	33.3
Strongly Agree	8	66.7

Note. n=12

Appendix I cont.

Table 17

Student Responsibility to Learn from the Simulation Activity

Student Responsibility to Learn from the Simulation Activity	n	%
Pre-Test Control Group		
Strongly Disagree	0	0.0
Disagree	2	16.7
Undecided	1	8.3
Agree	7	58.3
Strongly Agree	2	16.7
Post-Test Control Group		
Strongly Disagree	1	8.3
Disagree	1	8.3
Undecided	1	8.3
Agree	5	41.7
Strongly Agree	4	33.3
Pre-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	0	0.0
Undecided	1	8.3
Agree	6	50.0
Strongly Agree	5	41.7
Post-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	0	0.0
Undecided	0	0.0
Agree	2	16.7
Strongly Agree	10	83.3

Note. n=12

Appendix I cont.

Table 18

Knowing How to Get Help with Confusing Concepts

Knowing How to Get Help with Confusing Concepts	n	%
Pre-Test Control Group		
Strongly Disagree	0	0.0
Disagree	0	0.0
Undecided	0	0.0
Agree	8	66.7
Strongly Agree	4	33.3
Post-Test Control Group		
Strongly Disagree	0	0.0
Disagree	0	0.0
Undecided	0	0.0
Agree	8	66.7
Strongly Agree	4	33.3
Pre-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	0	0.0
Undecided	1	8.3
Agree	6	50.0
Strongly Agree	5	41.7
Post-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	0	0.0
Undecided	0	0.0
Agree	3	25.0
Strongly Agree	9	75.0

Note. n=12

Appendix I cont.

Table 19

Using Simulation Activities to Learn Critical Aspects of Skills

Using Simulation Activities to Learn Critical Aspects of Skills	n	%
Pre-Test Control Group		
Strongly Disagree	0	0.0
Disagree	0	0.0
Undecided	2	16.7
Agree	6	50.0
Strongly Agree	4	33.3
Post-Test Control Group		
Strongly Disagree	0	0.0
Disagree	1	8.3
Undecided	1	8.3
Agree	7	58.3
Strongly Agree	3	25.0
Pre-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	1	8.3
Undecided	1	8.3
Agree	8	66.7
Strongly Agree	2	16.7
Post-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	0	0.0
Undecided	0	0.0
Agree	5	41.7
Strongly Agree	7	58.3

Note. n=12

Appendix I cont.

Table 20

Responsibility of Instructors to Educate on Simulation during Class

Responsibility of Instructors to Educate on Simulation	n	%
Pre-Test Control Group		
Strongly Disagree	0	0.0
Disagree	0	0.0
Undecided	0	0.0
Agree	9	75.0
Strongly Agree	3	25.0
Post-Test Control Group		
Strongly Disagree	0	0.0
Disagree	0	0.0
Undecided	1	8.3
Agree	8	66.7
Strongly Agree	3	25.0
Pre-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	0	0.0
Undecided	2	16.7
Agree	7	58.3
Strongly Agree	3	25.0
Post-Test Experimental Group		
Strongly Disagree	0	0.0
Disagree	0	0.0
Undecided	0	0.0
Agree	5	41.7
Strongly Agree	7	58.3

Note. n=12

Appendix J cont.

Table 21

Correct Factors that Have Been Identified as Predictors for Difficulty with BMV

Correct Factors Selected	n	% Correct
Age Greater than 55		
Correct - Control	12	100
Correct – Experimental	12	100
Mallampati Score III		
Correct - Control	7	58.3
Correct - Experimental	8	66.7
No Teeth		
Correct - Control	12	100
Correct - Experimental	11	91.7
Short Thyromental Distance		
Correct - Control	9	75.0
Correct - Experimental	9	75.0

Note. n=24

Appendix J cont.

Table 22

Incorrect Factors that Have Been Identified as Predictors for Difficulty with BMV

Incorrect Factors Selected	n	% Correct
Age Younger than 12		
Incorrect - Control	3	25.0
Incorrect - Experimental	0	0.0
Long Thyromental Distance		
Incorrect - Control	1	8.3
Incorrect- Experimental	2	16.7
Mallampati Score II		
Incorrect - Control	0	0.0
Incorrect - Experimental	0	0.0
Short Interincisor Distance		
Incorrect - Control	4	33.3
Incorrect – Experimental	4	33.3

Note. n=24