Marian University

Leighton School of Nursing

Doctor of Nursing Practice

Final Project Report for Students Graduating in May 2022

The Effects of Video Simulation Learning on Preoperative Evaluation

Robin Betz

Marian University

Leighton School of Nursing

Chair: Bradley Stelflug, DrAP, MBA, CRNA

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(Signature)

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The Effect of Simulation Learning on Preoperative Evaluation

This project was submitted to the faculty of Marian University Leighton School of Nursing as partial fulfillment of degree requirements for the Doctor of Nursing Practice Certified Registered Nurse Anesthetist Track. The student registered nurse anesthetist (SRNA) curriculum consists of didactic and clinical. While the didactic portion contains the knowledge needed clinically, it is often hard to transition that knowledge into practice. Simulation is a proven method shown to help SRNAs transition into practice. Furthermore, simulation learning improves SRNA confidence, knowledge, and clinical performance (Ambardekar et al., 2016). It is vital SRNAs are both confident and knowledgeable in their comprehension and ability to perform basic skills, such as preoperative anesthesia evaluations. Confidence and knowledge translate into efficiency in practice and aids in improved patient safety and outcomes in the clinical setting (Ritter et al., 2020).

Background

Multiple studies detail the value of simulation-based learning related to instructing SRNAs on different technical and non-technical skills, including peripheral nerve blocks, “cannot intubate/cannot oxygenate” scenarios, situational awareness, and decision making. One vital area to the efficiency and safety of nurse anesthetists is their ability to evaluate patients preoperatively.

The preoperative anesthesia evaluation is an essential part of safely anesthetizing patients. Standard of care dictates an evaluation must be performed on every patient prior to the administration of anesthesia (Sweitzer, 2021). It is widely accepted that in a healthy patient

receiving a low-risk procedure the preoperative evaluation can be done the day of surgery, however, in a high-risk patient or procedure, a more extensive workup before the day of surgery (DOS) is warranted (Sweitzer, 2021).

Preanesthetic clinics provide a location for these assessments to take place. Preanesthetic clinics have been shown to reduce unnecessary testing, case cancellations, delays, and mortality (Sweitzer, 2021). Blitz et al. (2016) hypothesized preoperative evaluation clinics reduction in mortality could be contributed to an increase in patient engagement, better communication between interdisciplinary teams, and improved clinical coordination.

The preoperative evaluation includes a clinical evaluation, a perioperative risk assessment, management and optimization of diseases affecting perioperative risks, creating a plan for anesthesia care, educating patients and their families regarding the perioperative period, obtaining informed consent, regulating the appropriateness of the anesthesia setting, discussing preventative care measures, and meeting regulatory requirements (Sweitzer, 2021). The clinical evaluation and risk assessment are fundamental in determining if the procedure can be safely performed. The clinical preoperative evaluation and assessment aspect minimally includes a patient interview, focused examination, airway assessment, review of medical records, arranging preoperative testing deemed necessary, and consulting any specialists indicated (Sweitzer, 2021). The risk assessment is another fundamental piece of the preoperative evaluation and discloses risks associated with the patient's condition and the planned procedure (Sweitzer, 2021).

Risk factors associated with patient conditions are often delineated during the preoperative evaluation and assessment. These risk factors include the American Society of Anesthesiologists physical status (ASA-PS), functional status, biomarkers, and surgical risks related to the type of procedure (Sweitzer, 2021). Furthermore, there are medical ailments

associated with an increased risk for perioperative adverse events, it is vital the SRNA know how to identify these conditions and employ risk stratification. Conditions that increase risk for perioperative adverse events include cardiovascular, cerebrovascular, neurological, pulmonary, liver, endocrine, thyroid, and kidney diseases (Sweitzer, 2021). Further risks are associated with advanced age, anemia, malnutrition, thromboembolic disorders, obesity, tobacco use, and alcohol misuse (Sweitzer, 2021). The forenamed conditions not only indicate a potential for perioperative complications but can also alter the way the anesthesia providers deliver care. Once threats to patient safety have been identified the anesthetist can optimize the risk factors, create an anesthetic plan, and obtain informed consent.

The preoperative assessment goal is to evaluate the patient and their tolerance to anesthesia, reduce risk, and prepare the patient for surgery (Sweitzer, 2021). The preoperative evaluation should be conducted at an appropriate timeframe for the patient's risk level and the type of procedure being performed. A thorough and timely preoperative assessment has been shown to improve patient satisfaction and decrease complications, cancellations, costs, delays, and overall mortality (Sweitzer, 2021).

Problem Statement

Anesthesia mortality has fallen over the past several decades and is now estimated to be approximately one death per every 200,000 to 300,000 anesthetics (Falk & Fleisher, 2020). The preoperative evaluation aids in reducing risks and ultimately mortality related to anesthesia care, thus making it a fundamental skill the SRNA must possess (Blitz et al., 2016). This project aimed to determine how an SRNA's confidence and knowledge are affected when receiving education on preoperative interviews via reading material compared to those who receive instruction via video simulation along with the reading material.

Gap Analysis

Current practice at Marian University includes the students reading *Nurse Anesthesia* by John Nagelhout then performing a simulation of preoperative evaluation on a live model. Best practice guidelines for simulation include a purposeful design to meet specified objectives and achieve expected outcomes (INACSL, 2016). Video based learning as an adjunct to simulation allows for specified objectives to be defined, thus making it more likely to achieve expected outcomes. The implementation of video-based learning as an adjunct to simulation regarding preoperative anesthesia evaluation is appropriate at Marian University in the Certified Registered Nurse Anesthesia Program. Video simulation of preoperative evaluations was not previously utilized at Marian University; therefore, the gap in best practice and research is present, and Marian is an appropriate site for implementation.

Review of Literature

A comprehensive search was conducted utilizing the Hackelmeier Memorial Library. The search included databases EBSCOhost, PubMed, WorldCat.org, and CINAHL. Key phrases "student nurse anesthesia simulation", "nurse anesthesia student's perception of simulation", and "anesthesia providers perception of simulation" were used. This search methodology yielded 155, 51, and 158 results respectively. Inclusion criteria included peer reviewed articles, English language, published between 2015 and 2021, a focus on simulation learning, and measurement of confidence, knowledge, and/or skill level of the participants. The search was concentrated on healthcare-related participants to streamline relevance. Exclusion criteria included articles greater than five years old and articles not focusing on simulation, confidence, knowledge, or skill level. A total of 13 articles were selected for this literature review.

Simulation as an Adjunct to Learning

Preanesthetic evaluations have the potential to yield decreased complications, better flow of peri anesthetic care, improved patient satisfaction, and decreased cost, cancellations, and mortality (Sweitzer, 2021). Duffy et al., (2019) asserts simulation is widely accepted as an effective adjunct to didactic in both anesthesiology and other medical specialties. Gauger et al., (2018) define simulation as a method to replace or amplify real-life health encounters by utilizing lifelike mannequins, physical models, standard patients, or computers. Benefits of simulation include increased confidence, knowledge, and skill level (Tsai et al., 2016). Simulation also enhances competence in procedures rarely seen in clinical practice (Gauger et al., 2018), compensates for gaps in training (Duffy et al., 2019), and meets learner's needs without risk to the patient or learner (Ambardekar et al., 2016). Furthermore, exposure to a specific skill leads to increased patient safety (Staun et al., 2020). Additional benefits to the participant include the ability to ask questions, nurture friendships, and build mentorships (Duffy et al., 2019). Ambardekar et al., (2016), Duffy et al., (2019), and Ritter et al., (2020) acknowledge simulation retention has been noted up to one-year post-simulation lab experience, further highlighting the effectiveness of this learning adjunct.

Numerous studies detail how simulation affects learners' perception of confidence and knowledge (Ambardekar et al., 2016, Duffy et al., 2016, Tsai et al., 2016). Seven articles in this literature review are in agreeance simulation has a positive impact on a participant's overall experience (Ambardekar et al., 2016; Duffy et al., 2019; Gauger et al., 2018; Ritter et al., 2020; Shields & Gentry, 2020; Staun et al., 2020; Tsai et al., 2016). Many of these articles focused on the measurement of confidence and/or knowledge. Confidence was positively affected in six of the eight articles, signifying simulation increases a learner's confidence related to a specific skill (Gauger et al., 2018; Tsai et al, 2016; Duffy et al., 2019; Staun et al., 2020; Ambardekar et al.,

2016; Ritter et al., 2020). Confidence was increased to a greater extent in participants with less experience in studies performed by Ritter et al., (2020) and Tsai et al., (2016).

Non-technical and Technical Skills

Simulation has been shown to improve technical and non-technical skills alike in the medical field (Ambardekar et al., 2016). Non-technical skills are essential in the response to critical events and learning these skills is imperative (Duffy et al., 2019). Non-technical skills gained through the use of simulation include communication, situational awareness, leadership, and coordination (Tsai et al., 2016). Communication is often cited as a factor in medical errors and is the cause of 64% of sentinel events documented (Tsai et al., 2016). Mental planning (Ritter et al., 2019) and critical thinking (Ambardekar et al., 2016) were also quoted as non-technical skills attained through simulation.

Anxiety and Simulation Learning

Studies by Lewis (2019) and Ambardekar et al., (2016) detailed barriers to simulation learning, declaring perceived overall cognitive load (POCL) and anxiety as factors influencing performance during simulation. Lewis, (2019) noted the level of support offered by the simulation staff would decrease cognitive load and anxiety and ultimately lead to higher performance and cognitive processing. A safe, supported, confidential, and non-judgmental learning environment was identified as necessary to minimize anxiety and improve learning outcomes (Ambardekar et al., 2016).

Clinical Performance Post-Simulation and the Need for Additional Research

In a study by Gauger et al., (2018) both procedural time and procedural performance were assessed via timing the procedure and the Cricothyroidotomy Skills Maintenance Program Global rating scale and checklist. The measurements indicated procedural time was decreased

while performance was increased (Gauger et al., 2018). Shields & Gentry, (2020) tracked the participant's ability to interpret and recognize transesophageal echocardiogram images as well as cardiac pathology identification. These studies, along with numerous others, described the need for further analysis of simulation-based training concerning the translation of training into clinical practice (Ambardekar et al., 2016, Tsai et al., 2016, Yunoki & Sakai, 2017). Simulation retention (Gauger et al., 2018), clinical outcomes (Shields & Gentry, 2020), reduction of patient mortality and morbidity (Tsai et al., 2016), and improved patient care (Ambardekar et al., 2016) were all topics implicated for future research associated with simulation as a learning adjunct.

Summary

This review of the literature highlights the benefits of simulation learning in the healthcare field, particularly within anesthesia. Simulation is effective in boosting confidence, knowledge, and skill level regarding both technical and non-technical skills (Ambardekar et al., 2016, Yunoki & Sakai, 2017).

Theoretical Framework

The theoretical framework guiding this DNP project was the NLN Jefferies Simulation Framework. The NLN Jeffries Model encompasses the concepts of context, background, design, simulation experience, facilitator and educational strategies, participant, and outcomes. The NLN Jefferies framework can be used to evaluate simulation training, this study focused on the outcome's aspect of this framework, specifically participant and learning outcomes. Cowperthwait (2020) notes that through simulation-based learning, both an increase in participant's confidence and their learned abilities can be transitioned into clinical practice. Utilization of the NLN Jefferies framework evaluated simulation regarding preoperative

evaluation on students in Marian University's DNP Nurse Anesthesia program for the purpose of this DNP study.

Goals, Objectives, and Expected Outcomes

The goal of this DNP project was to establish how video learning can aid in developing self-confidence and knowledge regarding simulation of preoperative evaluation in the SRNA. The objective of this project was to determine if video learning improves self-confidence and knowledge in the Marian SRNA. Expected outcomes consisted of the video enhancing self-confidence and learning.

Project Design

The intervention was to introduce video simulation teaching regarding preoperative evaluations for anesthesia. Current practice at Marian University consisted of the SRNA reading Chapter 20 in *Nurse Anesthesia* by John Nagelhout and Sass Elisha. After completing the required reading, the SRNA was then asked to perform a preoperative evaluation on a standard model. The randomized control group of 12 students followed current practice. The randomized experimental group of 12 participants received a video detailing best practice preoperative evaluation and completed the required reading, then performed the preoperative evaluation on the same model. Confidence was assessed post-intervention via a modified Student Satisfaction and Self Confidence in Learning survey. A post-simulation quiz was administered to evaluate knowledge gain. The control group was later offered the simulation video on preoperative evaluation to ensure fairness and equal learning opportunity.

Methods

Traditional learning modalities in anesthesia include reading materials followed by performing vital anesthesia skills, such as a preoperative evaluation. This DNP project incorporated a seven-minute video detailing best practice preoperative evaluation following the guidelines detailed in *Nurse Anesthesia* by John Nagelhout. The students then participated in a simulation lab in which they performed a preoperative anesthesia evaluation on a single, standard patient. Directly after the simulation students evaluated their confidence level and took a quiz that quantified their knowledge base. The survey measured the student's confidence in their ability to perform a preoperative evaluation. The knowledge quiz determined if the video provided to the experimental group increased level of understanding pertaining to preoperative assessment.

For this quality improvement project, the 2023 Marian class of SRNAs were randomized into two groups of 12 participants each. Group one read Chapter 20 of *Nurse Anesthesia* by John Nagelhout and then performed a preoperative evaluation on a live model. Group two was provided with a video depicting preoperative evaluation along with reading Chapter 20 of *Nurse Anesthesia*. Group two then completed their preoperative evaluation on the same live model. The class rated their confidence via a survey post-simulation. Knowledge was assessed through a quiz post intervention.

Measurement Instrument

Confidence was evaluated using a five-point Likert Scale, a validated modified Student Satisfaction & Self Confidence in Learning Preoperative Evaluation & Assessment (Appendix A). The SRNAs rated their confidence post-intervention on a scale of one to five, one being strongly disagree and five being strongly agree. Knowledge was assessed via a ten-question post

simulation quiz pertaining to the preoperative assessment evaluation. The knowledge post simulation quiz was validated by a team of CRNAs (Appendix B).

Data Analysis

Data was compiled and analyzed via Microsoft Excel (Appendix C). Confidence was analyzed via a Wilcoxon test to determine if the experimental group's self-confidence was increased as hypothesized. A Wilcoxon test compares two groups to determine if the groups are statistically significant regarding a particular measurement. Application of the Wilcoxon test was deemed appropriate as comparison between two groups was the data point being evaluated. The statistics detailing confidence showed a test indicator of ten, which infers there is a difference in confidence between the control group and experimental group. The data was then analyzed utilizing the t test to determine if statistical significance was present. A t-test is designed to determine if there is a statistical difference between the two groups. The confidence t test determined a p value of 0.0087, indicating a highly significant difference between the control group and the experimental group, with the experimental group exhibiting a significant increase in confidence.

A t-test was also employed to determine knowledge gain and delineate if knowledge improvement was statistically significant between the control and experimental group. The t-test was appropriate to utilize in this setting because the goal was to conclude which group had a higher mean test score. The t-test confirmed knowledge difference between the control group and the experimental group was mildly significant, with a p value of 0.0697.

Discussion

The result of this project depicts the effectiveness of video simulation when employed on SRNAs at Marian University considering student confidence and knowledge. Students who received a video depicting best practice preoperative evaluations rated their confidence at an average of 38.2 as compared to a confidence score of 34.1 in students who did not receive a video. Furthermore, the average test scores were 71.1% compared to 67.5% respectively in students who received the video versus those who did not. Video learning improved confidence and knowledge in the Marian SRNA concerning preoperative evaluation simulation test out.

Conclusion

SRNAs are subject to didactic before entering a clinical setting. Simulation has been shown to improve knowledge and confidence in the SRNA, which can lead to improved clinical outcomes (Ritter et al., 2020). This DNP project provided a video-based intervention the SRNAs used in adjunct with didactic and simulation to aid in mastering preoperative anesthesia evaluations. The video instruction led to increased confidence in performance and a marginally improved level of knowledge concerning preoperative evaluations in Marian SRNAs. Weaknesses of this project include a lack of objective data to determine if the skill was successfully performed and self-reporting of confidence using a Likert- scale can be inaccurate. Future studies should objectively evaluate how successfully the skill is performed and how the skill set is translated into practice. Additional research on the longevity of the skill retained is also warranted.

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Appendix A

Student Satisfaction & Self-Confidence in Learning Preoperative Evaluation & Assessment

Instructions: This questionnaire is a series of statements about your personal attitudes related to the instruction received regarding preoperative anesthesia evaluation & assessment. 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. 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 survey is anonymous.

Mark:
1 = STRONGLY DISAGREE with the statement
2 = DISAGREE with the statement
3 = UNDECIDED - you neither agree nor 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 method used regarding this subject matter was helpful and effective	1	2	3	4	5
2. This teaching provided me with a variety of learning materials and activities to promote my learnings for preoperative anesthesia evaluation & assessment competency check-off	1	2	3	4	5
3. I enjoyed how my facilitator(s) guided the teaching	1	2	3	4	5
4. The teaching materials used in this exercise were motivating and helped me to learn	1	2	3	4	5
5. The way my facilitator(s) conducted the learning objective was suitable to the way I learn	1	2	3	4	5
Self-Confidence in Learning	**SD**	**D**	**UN**	**A**	**SA**
6. I am confident that I am mastering the content of this learning activity my facilitator(s) presented to me	1	2	3	4	5
7. I am confident this teaching exercise covered critical content necessary for the mastery of preoperative anesthesia evaluation & assessment competency	1	2	3	4	5
8. I am confident that I am developing the skills and obtaining the required knowledge from this learning modality to perform necessary tasks in a clinical setting	1	2	3	4	5
9. My facilitator(s) used helpful resources to teach the preoperative anesthesia evaluation & assessment competency	1	2	3	4	5
10. It is my responsibility, as the student, to learn what I need to know from this activity	1	2	3	4	5
11.I know how to get help when I do not understand the concepts covered in the learning activity	1	2	3	4	5
12.I know how to use activities to learn critical aspects for preoperative anesthesia evaluation & assessment competency check-off	1	2	3	4	5
13.Completion of the required preparatory material improved my self-confidence for mastery of preoperative anesthesia evaluation & assessment	1	2	3	4	5

Appendix B

Knowledge Test

1. The extent of the preoperative workup depends on all of the follow EXCEPT:
    a. Existing medical conditions of the patient
    b. Proposed surgical procedure
    c. Determining postoperative disposition of the patient
    d. Type of anesthesia
2. Patients should be instructed to stop smoking:
    a. 12-48 hours before surgery
    b. 24-48 hours before surgery
    c. 36-48 hours before surgery
    d. 48-72 hours before surgery
3. Thyromental distance is associated with all of these EXCEPT:
    a. A distance less than 7 cm is indicative of a difficult intubation
    b. Is a test to determine if the oral and pharyngeal axes will align
    c. Represents the strait distance between the prominence of the thyroid cartilage and the bony point of the lower mandibular border
    d. A distance less than approximately 3 fingerbreadths is indicative of a difficult laryngoscopy
4. Mallampati class II you would be unable to visualize:
    a. Soft palate
    b. Tonsillar pillars
    c. Uvula
    d. Tonsillar faucets
5. The most common reason for anesthesia-related medicolegal claims is:
    a. Wrong site surgery
    b. Nerve damage
    c. Post-operative respiratory demise requiring hospitalization
    d. Dental injuries
6. Which type of surgery is associated with a high risk of developing perioperative adverse cardiac events?
    a. Carotid
    b. Intrathoracic
    c. Aortic
    d. Endocrine
7. A SBP < 180 and a DBP < 110 are independent risk factors for perioperative cardiovascular complications.
    a. True
    b. False
8. STOP BANG is an acronym used to determine if a patient has an increased risk for:
    a. Difficulty masking the patient
    b. Difficult intubation
    c. Risk for aspiration
    d. Risk for obstructive sleep apnea
9. All of the following are factors that increase the risk for aspiration EXCEPT:
    a. Age > 50
    b. Pregnancy
    c. Pain
    d. Smoking
10. A patient a healthy patient with minimal alcohol use and a BMI of 35 is to undergo surgery, what ASA classification would you assign this patient?
    a. ASA I
    b. ASA II
    c. ASA III
    d. ASA IV

Appendix C

		Students Evaluated With Video											
	Question #	Student 1	Student 2	Student 3	Student 4	Student 5	Student 6	Student 7	Student 8	Student 9	Student 10	Student 11	Student 12
Each Student Answered 13 Questions on a Likert Scale to assess Satisfaction and Confidence in Learning	1	4	4	5	5	5	5	5	4	5	5	5	5
	2	4	3	5	5	5	5	5	5	5	5	5	5
	3	4	4	5	5	5	5	5	4	5	5	5	5
	4	3	4	5	5	5	5	5	4	5	5	5	5
	5	4	3	5	5	5	5	5	4	5	5	5	4
	6	5	4	5	5	4	4	4	4	4	4	5	5
	7	5	4	5	5	5	5	5	5	5	5	5	5
	8	4	3	5	5	5	5	5	5	5	4	5	5
	9	5	3	5	5	5	4	5	4	5	5	5	5
	10	5	4	5	5	5	5	4	5	5	5	5	5
	11	5	5	5	5	5	5	5	5	5	5	5	5
	12	5	5	5	5	5	5	5	5	5	5	5	5
	13	4	4	5	5	5	5	5	5	4	5	5	5
	Sum	57	50	65	65	64	63	63	59	63	63	65	64
	Test Score %	70	60	70	70	90	80	90	60	60	80	70	60

Average Sum Based upon Likert Questions	61.75
Average Satisfaction with Learning Sum (1-5)	23.5
Average Self confidence Sum (6-13)	38.25
Average Test Score %	71.66666667

		Students Evaluated With Out Video											
	Question #	Student 1	Student 2	Student 3	Student 4	Student 5	Student 6	Student 7	Student 8	Student 9	Student 10	Student 11	Student 12
Each Student Answered 13 Questions on a Likert Scale to assess Satisfaction and Confidence in Learning	1	4	4	5	4	5	3	4	2	4	4	4	3
	2	4	4	5	5	4	2	4	4	4	4	4	4
	3	5	5	5	5	5	2	3	2	3	4	3	3
	4	4	4	5	5	5	3	4	3	2	4	3	3
	5	4	4	5	5	4	3	3	2	3	3	2	4
	6	4	5	4	5	5	5	4	4	4	4	4	4
	7	4	5	5	5	5	5	5	4	4	4	4	3
	8	4	5	5	5	5	4	4	4	4	5	4	3
	9	4	4	5	5	4	2	3	2	2	4	2	2
	10	5	5	4	5	5	3	5	4	5	5	4	3
	11	5	5	5	5	5	5	4	4	5	5	5	4
	12	5	5	5	5	1	5	5	4	4	4	4	4
	13	4	5	5	5	4	5	5	3	4	5	3	4
	Sum	56	60	63	64	57	47	53	42	48	55	46	44
	Test Score %	70	70	80	80	70	70	80	80	40	60	40	70

Average Sum Based upon Likert Questions	52.916667
Average Satisfaction with Learning Sum (1-5)	18.833333
Average Self confidence Sum (6-13)	34.0833
Average Test Score %	67.5