Marian University

Leighton School of Nursing

Doctor of Nursing Practice

Final Project Report for Students Graduating in May 2022

Debriefing After a Difficult Airway Algorithm Simulation

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Introduction

The difficult airway algorithm is a necessary technique that must be mastered by all student nurse anesthetists. Students in Marian University's Nurse Anesthesia Program are taught the potentially life-saving skills included in the difficult airway algorithm. This project added a debriefing component to the simulation training usually conducted in the program. The purpose is to prove that debriefing increases their knowledge on the subject, enhances their confidence and satisfaction when applying difficult airway situations.

Background

Failure to properly implement the difficult airway algorithm can lead to hypoxic brain injury or death of the patient in a very short time. Issues from the lack of learning the difficult airway algorithm include delayed recognition of critical events, decreased confidence and high anxiety when faced with not being able to breath for the patient. It would be rare for a student registered nurse anesthetist to have experienced a cannot intubate cannot ventilate (CICV) situation. A CICV situation is stressful for even the most experienced anesthesia providers that have practiced for many years. These situations escalate very quickly, and immediate action must be taken. Delayed reaction or incompetent skills when managing a CICV situation can lead to death of the patient.

While in school, students often learn of the difficult airway algorithm. Frequent practice and memorization of each step is vital. Inexperience is a major factor that can lead to a hypoxic brain injury when managing a CICV situation. Providing a debrief to the simulation experience may help to enhance students' knowledge, confidence and skills when faced with a difficult airway situation. Simulation training has "shown that they can have an effect on improving patient outcomes and possibly malpractice claims" (Kurup, et.al, 2017). Simulations can provide scenarios that a student may not encounter during school or even years after graduating. A study by the National Council of State Boards of Nursing, NCSBN, in 2014, found that replacing clinical experience with simulation experience resulted in no significant difference in clinical competency (Hayden et. al, 2014). By providing a debriefing after the difficult airway algorithm simulation without replacing clinical experience should further the clinical competence of the students.

An effective simulation is needed in order to educate students appropriately. The International Nursing Association for Clinical Simulation and Learning (INACSL) standards have created best practice guidelines for simulation practice. These guidelines include a debriefing portion to the simulation. Using these guidelines, an improved simulation experience can be composed that will optimize the education and technical skills of all the students participating in the simulation.

Problem Statement

Marian University student registered nurse anesthetists in their first year of training are inexperienced and lack the knowledge and confidence to manage a difficult airway situation. A cannot intubate, cannot ventilate simulation scenario can be created to mimic what an anesthesia provider may experience in the clinical setting using the INACSL standards of best practice guidelines.

Gap Analysis

Currently the Marian University Nurse Anesthesia program provides simulations to students, but these simulations are not designed using a debrief component. Therefore, students may lack important feedback after the simulation that may make them more competent providers of the difficult airway algorithm. The INACSL standards include a debrief component as part of their evidence-based best practice. Adding the debrief component may heighten the experience satisfaction, knowledge and self-confidence to those who participate.

Review of Literature

Search Methodology

Articles were located on PubMed and Google Scholar. The search was narrowed down to articles with publication dates within the last seven years. *Difficult airway algorithm, high-fidelity, cannot intubate cannot ventilate (CICV), simulation training, knowledge, confidence, satisfaction, debriefing, INACSL standards of best practice, anesthesia,* and *airway management* were the Boolean search phrases used. Thirteen relevant articles were used based on the information they provided. The inclusion criteria for these studies provide simulations using healthcare personnel, provide information regarding knowledge, confidence and/or clinical skill outcomes. Each of these articles had a level of evidence that ranged from a level I to level IV. These articles included simulation training, increased knowledge, confidence and skills. The type of healthcare providers and whether participants were students or practicing providers did not factor into the results of the search.

Simulation

Simulation use for advancing knowledge, confidence, and clinical skills was a common topic from the selected articles. By providing a simulation scenario to students prior to clinical, practicing healthcare workers enhance their ability to perform the sought-after task (Offiah, G., et al., 2019). Many of these studies implement the use of high-fidelity simulations. High fidelity simulations use a life-like manikin that is able to reproduce human physiology. Practicing medical residents that have difficult airway management simulations throughout their residency have improvement with compliance with guidelines (Hubert, et. al, 2014). When it comes to advanced airway management, simulation training is by far superior to no simulation training at all (Kennedy et. al, 2014). Simulations have been shown to be an ample substitution to clinical experience in nursing training if clinical is unavailable. By splitting nursing student's clinical hours and simulation hours to a 50:50 ratio there is not a statistically significant difference in clinical knowledge or competency compared to students that spend all their hours in clinical and none in simulation (Hayden, et. al, 2014). Students that have had high-fidelity simulation training of the CICV scenario have a shorter decision-making time than those students that have not participated in a simulation (McCrossin, 2014).

Knowledge

Increased knowledge and education is one of the major goals of simulation training for anesthesia residents (Yunoki, K., & Sakai, T., 2018). Offering simulation compared to no simulation, provides learners an opportunity to get hands-on experience prior to entering the clinical setting. For learners that have less didactic and clinical experience, such as underclassmen, these simulations are highly recommended (Erlinger, 2019). Many studies seek the best way to improve knowledge and compare simulation to other methods of teaching. When comparing high fidelity simulation training to computer-based case studies, the simulation was superior in enhancing the student's knowledge and skills in Mejia's 2018 study regarding treatment of malignant hyperthermia. Students that experience high-fidelity simulations display and report an increased knowledge compared to students that only have traditional learning (D'Souza, et. al, 2017). A systematic review by Alanazi, et. al (2017), concluded that evidence from many different studies using high fidelity simulations in education of healthcare students significantly improves knowledge, skills and self-confidence. All of which are extremely important when implementing the difficult airway algorithm.

Confidence

Confidence is of utmost importance when it comes to caring for a patient in any healthcare setting. Whether debriefing after simulation experience improves confidence has been one of the major outcomes that many of these articles seek to ascertain. The results of these articles all have similar outcomes of increased confidence. When nursing students are put through a high-fidelity simulation with a debriefing segment, they demonstrate advanced skills, critical thinking and a greater self-confidence in caring for patients (Samawi, 2014). Well-constructed simulation learning with adequate debriefing can help not only students with little to no experience, but practicing healthcare providers such as physicians and nurses that experience a simulation scenario have shown a great improvement in knowledge and confidence (Boiling& Hardin-Pierce, 2016). To decide when to employ the difficult airway algorithm, the provider must be quick and confident. Anesthesia trainees that participate in high-fidelity simulation compared to those that do not, show an enhanced decision-making time and confidence (McCrossin, et. al, 2014). Therefore, it is important to determine whether adding a debriefing segment to the simulation training experience will enhance the participants confidence of the difficult airway algorithm.

Theoretical Framework

The difficult airway algorithm simulation with debrief component will be based on the INACSL standards. The INACSL standards use the NLN Jeffries Simulation Theory. This theory starts by finding a need for a well-designed simulation-based experience, such as the difficult airway algorithm. The NLN Jeffries Simulation Theory then seeks to use the desired goals and outcomes to influence how the simulation will be designed. Once the goals and outcomes are determined, the design of the simulation must factor in how the facilitator and the participants can interact with each other throughout the project. For this difficult airway algorithm simulation, a debriefing session will be implemented by the facilitator and participant. This debriefing session aims to enhance confidence, knowledge and satisfaction.

The NLN Jeffries Simulation Theory emphasizes key concepts which include environment, trust, collaboration, experience, how much the design is interactive, and learner centered. The simulation should be hosted in a non-judgmental, learning-centered environment and facilitated by trusted investigators. Collaboration and interaction between the participants and the investigators must be appropriate to the situation. Once the simulation is created, the key concepts can be provided to the participants.

Goals, Objectives, Expected Outcomes

The goal of this simulation is to determine whether debriefing increases knowledge, confidence and satisfaction when applying the difficult airway algorithm. It is expected that students who are given a debrief component to their simulation training will show a higher level of knowledge and confidence when applying the difficult airway algorithm, in addition to an increased overall satisfaction with the simulation experience.

Project Design/Methods

Twenty-four Marian University Nurse Anesthesia students in their first year of the program were randomly divided into two groups. The control group participated in the difficult airway simulation training that was currently used in the Marian program. The experimental group participated in the same simulation with the addition of a debrief component. then the data was compared and analyzed. Active participation followed by a debriefing session for the experimental group. An evaluation via a confidence and satisfaction survey and a five-question knowledge-based posttest was delivered to the control group immediately after active participation and to the experimental group after the debriefing session. Once completed by both groups the data was compared and analyzed. After the control group finished their survey and posttest, they were permitted to have a debriefing session.

Project site

This project's setting was the Marian University simulation laboratory. This site allowed access to resources including a high-fidelity manikin, a ventilator, Ambu-bag and mask, direct laryngoscopy blades and handles, video-laryngoscopy equipment, laryngeal mask airways, and other readily available airway equipment. This site has trained personnel that were able to run the high-fidelity manikin and personnel that were able to help the participants if they required assistance.

Measurement Instruments

Participants were provided a rubric to follow prior to the simulation. Throughout the simulation all the students were evaluated on their ability at applying the difficult airway algorithm graded by a checklist. Then all the students were tested using the National League for Nursing (NLN) Survey which gathers participant's perceptions of their satisfaction and self-confidence with their simulation experience. This questionnaire examines the participants satisfaction and self-confidence and satisfaction from the simulation using twenty-three questions concerning satisfaction and thirteen for self-confidence. A five-question knowledge-based test was provided to each group.

Data Analysis

Demographics such as age and gender were collected and analyzed for both sample groups. Data collected from the questionnaires was analyzed using median age and experience. Then the results were compared between the control group and experimental group.

Findings and Results

The difficult airway algorithm simulation was scheduled for two different days. Twenty-four students participated in the simulation. Twelve students on day one (Control group) and 12 students on day two (experimental group) were given 30-minute blocks to complete the simulation. Every participant filled out an agreement form for the simulation and answered three different demographic questions prior to starting the simulation. Students were provided the same scenario regarding the difficult airway algorithm. The control group completed the knowledge-based posttest and the confidence and satisfaction survey after they completed the simulation training. The experimental group were given a debriefing session immediately after the simulation training. The debriefing session allowed the participant to discuss how he/she did during the simulation, in an environment conducive to learning and allowed the participant to speak openly. The experimental participants were asked how they felt they performed during the simulation and what they believed they could improve on. The participants were also asked what their thoughts were regarding how the simulation went and if it was what they expected. After the debriefing, the experimental group completed the same posttest and survey that the control group completed.

Demographics

Of the twenty-four participants, sixty-six percent were female (16); ages ranged from twenty-five to fifty-five years old with the median age of 30.5 and mean age of 33. All participants had previous nursing experience; experience ranged from three years to twenty years with the median experience of six years and mean of 6.79 years.

Descriptive

	Female	Male	Average Age	Average Years of Experience

Control Group	9	3	33.33	7.5
Experimental Group	7	5	32.75	5.833

Objective One: Difference in Participant Knowledge

Objective one was to determine whether debriefing after a difficult airway algorithm made a significant difference in the knowledge of the participants. Results of the knowledge-based posttest were analyzed using JASP software system, which is a software system that analyzes data and proves whether there is statistical significance between groups via the paired t-test. A paired sample t-test was performed to compare the knowledge of students that were involved in the debriefing and those that did not participate in the debriefing. Paired t-tests compare two variables of the same subject to determine whether there is a significant difference. when looking for the significant difference the p-value must be less than or equal to 0.05. Since the control group test scores (M=3.667, SD=0.778) were higher than the test scores of the experimental group (M=3.0, SD=1.206), there was no significant difference between the groups in participant knowledge.

Figure 1-A- Descriptive Statistics

Descriptive Statistics

	Control Group Test Scores	**Experimental Group Test Scores**
Valid	12	12
Missing	12	12
Mean	3.667	3.000
Median	3.500	3.000
Std. Deviation	0.778	1.206
Minimum	3.000	1.000
Maximum	5.000	5.000

Note- valid-number of participants used in group, missing- number of participants not used from total, mean- average number of all data points, median- middle value of all data points, standard deviation-how dispersed data is from mean, minimum- lowest score, maximum- highest score.

Figure 1-B- Paired Samples T-Test

Paired Samples T-Test

Measure 1		Measure 2	t	df	p	Mean Difference	SE Difference
Control Group Test Scores	-	Experimental Group Test Scores	1.483	11	0.166	0.667	0.449

Note. t-value- indicated difference in two sample sets, df (degrees of freedom)- maximum number of logically independent values, p-value- determines whether data is statistically significant enough to accept or reject hypothesis, SE (standard error)- measures accuracy of sample size distribution.

Descriptive

	N	Mean	SD	SE
Control Group Test Scores	12	3.667	0.778	0.225
Experimental Group Test Scores	12	3.000	1.206	0.348

The five-question knowledge-based test was created by the DNP student investigator and evaluated for content by two experienced nurse anesthetist faculty. Questions involved knowledge regarding equipment, procedures and timing of the difficult airway algorithm. These questions were evaluated on the number of correct answers.

Table 1-A

Test Question	**Control Group Results**	**Experimental Group Results**	**Percent Difference**
After your first unsuccessful intubation attempt, all of the following should be considered EXCEPT: Answer- Emergency invasive airway Incorrect- call for help, return to spontaneous	Correct= 12 Incorrect= 0 100% correct	Correct= 9 Incorrect= 3 75% correct	25% worse

ventilation, wake the patient			
True or false: After your first unsuccessful intubation attempt and face mask ventilation is not adequate, LMA placement is the next consideration. Answer- true Incorrect-false	Correct= 4 Incorrect= 8 33% correct	Correct= 5 Incorrect= 7 42% correct	9% better
Examples of an emergency noninvasive airways include (SELECT ALL THAT APPLY): Answer- combitube, king tube Incorrect- nasal rae, retrograde intubation	Correct= 8 Incorrect= 4 66% correct	Correct= 8 Incorrect= 4 66% correct	No difference
True or false: A King tube's distal end is intended for the esophagus and has two inflation ports one for each balloon. Answer- false Incorrect- true	Correct= 9 Incorrect= 3 75% correct	Correct= 4 Incorrect= 8 33% correct	42% worse
True or false: Retrograde intubation is an example of an invasive airway. Answer- true Incorrect- false	Correct= 10 Incorrect= 2 83% correct	Correct= 10 Incorrect= 2 83% correct	No change

Objective Two: Increased Participant Confidence

Objective two sought to determine whether the debriefing enhanced the participants confidence and satisfaction of the difficult airway algorithm. Confidence and satisfaction were measured using the NLN Student Satisfaction and Self-Confidence in Learning Survey. After completion of the simulation, and debrief if part of the experimental group, both groups filled out the survey rating their self-confidence and satisfaction with the difficult airway algorithm. A paired sample t-test was used to determine if there was a significant difference (p-value <0.05) in the mean confidence and satisfaction between the two groups. After reviewing the data analysis for self-confidence in the control group (M= 35.083, SD4.337) and the experimental group (M= 34.917, SD= 3.343), there was no significant difference between the two groups.

Figure 2-A Descriptive Statistics

Descriptive Statistics

	Control group Confidence	Experimental Group Confidence
Valid	12	12
Missing	12	12
Mean	35.083	34.917
Median	34.500	34.500
Std. Deviation	4.337	3.343
Minimum	29.000	30.000
Maximum	40.000	40.000

Note- valid-number of participants used in group, missing- number of participants not used from total, mean- average number of all data points, median- middle value of all data points, standard deviation-how dispersed data is from mean, minimum- lowest score, maximum- highest score.

Figure 2-B Paired Samples T-Test

Paired Samples T-Test

Measure 1		Measure 2	t	df	p
Control group Confidence	-	Experimental Group Confidence	0.084	11	0.934

Note. t-value- indicated difference in two sample sets, df (degrees of freedom)- maximum number of logically independent values, p-value- determines whether data is statistically significant enough to accept or reject hypothesis

Objective Three: Increased Participant Satisfaction

The data collected from the survey observing student satisfaction had very similar results as student self-confidence. Results showed that there was no significant difference between the control group (M= 22.33, SD= 2.6) and the experimental group (M= 22.08, SD= 4.0).

Figure 3-A Descriptive Statistics

Descriptive Statistics

	Control Group Satisfaction	**Experimental Group Satisfaction**
Valid	12	12
Missing	12	12
Mean	22.333	22.083
Median	23.000	23.500
Std. Deviation	2.605	4.033
Minimum	17.000	11.000
Maximum	25.000	25.000

Note- valid-number of participants used in group, missing- number of participants not used from total, mean- average number of all data points, median- middle value of all data points, standard deviation-how dispersed data is from mean, minimum- lowest score, maximum- highest score.

Figure 3-B Paired Samples T-Test

Paired Samples T-Test

Measure 1		**Measure 2**	**t**	**df**	**p**
Control Group Satisfaction	-	Experimental Group Satisfaction	0.158	11	0.877

Note. t-value- indicated difference in two sample sets, df (degrees of freedom)- maximum number of logically independent values, p-value- determines whether data is statistically significant enough to accept or reject hypothesis

Limitations, Recommendations and Implications for Change

The difficult airway algorithm is an important tool that anesthesia providers must know. This project on the difficult airway algorithm examined the effect that a debriefing session after a simulation experience had on first year anesthesia students.

Limitations

There were multiple limitations that affected this project. The sample population was very small. Twelve students per group limits how accurately the results can be generalized. For future consideration, replication of this project should be conducted using multiple anesthesia cohorts increasing the sample population.

The project only incorporated a debriefing session. There was not a baseline of student knowledge, self-confidence or satisfaction prior to the difficult airway algorithm simulation. Consideration of replicating this project would include a pretest that would be used as a reference to compare previous knowledge to what was learned throughout the simulation and debriefing session.

Additionally, student simulation experience was unknown. This project was conducted during the COVID-19 pandemic. This caused students to have variable amounts of simulation experience due to access to the simulation lab. Students with less simulation experience could have less self-confidence and satisfaction when participating in this project because of unfamiliarity with equipment and environment. Gathering data regarding past simulation experience would be recommended in future consideration of this project.

Implications to Practice

Determining whether a debriefing session after a difficult airway algorithm simulation increased knowledge, confidence and satisfaction of first year anesthesia students at Marian University was the primary goal of this project. After completion of this project, it remains unclear whether debriefing changes a student's base knowledge. Results to the knowledge-based portion of the project did not show any significant difference between the two groups. The confidence and satisfaction survey results were also not significantly different enough to show a positive or negative result of debriefing.

Marian University currently employs a difficult airway simulation that does not utilize a debriefing session after the experience. This debriefing should have increased the participants' clinical competencies (Jeong, K. I., & Choi, J. Y., 2017). However, limitations to this project showed that further research is needed in order to show that a debriefing component increases a student's knowledge, confidence, and satisfaction.

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