Trigger Films and Simulation: Educating Nurse Anesthesia Students

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December 5, 2017

Presented to the Faculty at the University of Michigan-Flint
In partial fulfillment of the requirements for the
Doctor of Anesthesia Practice Program
(Fall/2017)

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ABSTRACT

The purpose of this study was to evaluate if Student Registered Nurse Anesthetists (SRNAs) who participate in lecture and view of a trigger film video, related to undiagnosed malignant hyperthermia, would experience enhanced clinical decision-making behaviors in the simulation lab versus those that participate in lecture alone. Trigger films are short video clips (thirty seconds to two minutes) that portray situations a learner or clinician might experience.

Members of the Oakland University Beaumont Graduate Program of Nurse Anesthesia (OUBGPNA) class of 2018 received lectures on the recognition and treatment of Malignant Hyperthermia (MH), anaphylaxis and bronchospasm. Following the lectures, students were randomized to one of two groups. Group A viewed trigger films pertaining to anaphylaxis, bronchospasm, and MH and were later tested in the simulation lab on one of the three high-risk, low-frequency events. Group B reviewed PowerPoint lecture slides on the same three topics before participating in their simulated scenario. Both groups were unaware of which of the three scenarios would be simulated. Both groups underwent a Malignant Hyperthermia simulation scenario.

The two groups were compared to determine which group demonstrated superior clinical decision-making behaviors in the simulation lab following the implementation of the teaching strategies. No statistical significance was found concerning time to recognition of symptoms or time to initiate treatment for all but one of the variables examined. Time to cooling demonstrated statistical significance with Group A initiating cooling measures more quickly than Group B. Post study debriefing revealed that participants felt access to a trigger film either did, or would have afforded them more comfort with decision-making skills in the scenario. Teaching critical thinking skills for high-risk, low-frequency events is of utmost importance to the development of nurse anesthetists. Determining the best teaching strategy to provide this education is imperative.

Keywords: Trigger films**,** high-risk/low frequency events, critical thinking skills, malignant hyperthermia

INTRODUCTION

Two paramount aspects of the practice of anesthesiology are patient safety and education. Practical and confident decision-making curtails the risk of adverse events in the operating room. Anesthesia providers must synthesize a diverse and complex array of information in a short period while rendering care. Excellent critical thinking skills in combination with strong foundational knowledge are essential for the administration of a safe anesthetic.[1] Given the nature of anesthesia and the potential for error and poor outcome, the profession is constantly striving to improve safety through education, particularly among the profession's most novice practitioners. Although all anesthesia providers can benefit from review of high risk, low frequency events, it is essential that student nurse anesthetists learn to critically think through this type of scenario. In their quest to achieve this goal, anesthesia educators are looking at a variety of methodologies to assist learners in developing these essential critical thinking and problem solving skills.

Today's students do not always view traditional, teacher-centered methods as the most beneficial way to learn and retain important information.[2] Adapting conventional methods to the preferences of millennial learners has proven to be a challenge for educators.[2] The newest generation of learners is fluent with and intimately reliant upon technology in their daily lives; therefore, the use of technology in the classroom often meets their needs.[3] Technologies integrated into curricula have included audience response systems (clickers), virtual learning (Virtual I.V.™), downloadable media files (podcasts), and various human patient simulators.[3]

In addition to technologies, educational approaches are thought to have facilitative or hindering effects on critical thinking development as well.[4] While there is consensus about the importance of critical thinking, differences of opinion exist regarding how critical thinking should be taught.[4] Delivering education through the traditional lecture format is criticized for its emphasis

on the learner's passive receipt of knowledge rather than active development of critical thinking skills.[5,6] A passive learning environment, such as the lecture format, is not conducive to critical thinking development.[4] Participation in learning can influence critical thinking skill development. "Where active participation is encouraged, critical thinking is enhanced."[4]

Allan Paivio's Coding Theory suggests that verbal and visual cognitive processing mechanisms are separate, yet interwoven, functions to synthesize information.[7] Paivio's work revealed that visual imagery has a greater impact on long-term memory and is more readily retrievable than information coded as verbal.[3,7,8] This theory suggests that the use of visualization enhances learning and recall because images and words are processed at different sites in the central nervous system.[9]

Adapted from the aeronautic field is the use of simulation for educating nurse anesthetists. Since 1929, when Edwin Link invented the earliest flight simulation device, professions responsible for human lives have participated in simulation scenarios to prepare for the "real" event. Over the years, the use of simulation as an educational tool in the field of medicine has become more prevalent. Changes in medical practice that limit instruction time, expanding options for diagnosis and management, and advances in technology are contributing to greater use of simulation technology in medical education.[10] Four areas in which high-technology simulations are currently being used in medicine are laparoscopic techniques, cardiovascular diseases, and anesthesia.[10]

High fidelity human simulators (HFHS) are vastly technical machinery utilized by educators to encourage learning by immersion in patient-centered scenarios.[11] Anesthesia human patient simulators display controlled responses to both treatment interventions and failure to initiate appropriate interventions. Benefits of simulation technology include improvements in

acquisition and retention of knowledge when compared to the traditional lecture format.[1] These systems help to address the problem of poor skills training and lack of proficiency and may provide a method for clinicians to become self-directed lifelong learners. Providing an arena for participation in high-risk/low-frequency type scenarios for both students and professionals, simulation is becoming a standard in nursing education.

A survey of nurse anesthesia program directors in 2008[10] found that one-half of the nurse anesthesia programs had incorporated HFHS into their curricula.[10] The primary benefit of patient simulation is the ability to fashion critical thinking skills and develop efficient decision making processes without fear of harming a patient or incurring punitive actions from instructors.[10] Simulation labs are a place where students can make errors in patient care without harming live human beings. Significant results in clinical performance measures may demonstrate higher cognitive processes rather than simple memorization, and may indicate that information synthesis has occurred.[1] Simulation labs should always be a discipline free zone where the scenario mimics reality as closely as possible to preserve authenticity.

Trigger films are short video clips (thirty seconds to two minutes), that portray situations a learner or clinician may experience. The true prototype of a short film designed specifically to trigger reaction and discussion seems to have been developed in 1968 by Alfred H. Slote, Stanley H. Schuman, and Donald C. Pelz for the Highway Safety Research Institute at the University of Michigan.[11] The idea behind this form of film is to demonstrate how critical situations should be recognized and managed.[10] The goal when using these films is to stimulate the learner's active involvement in the critical thinking process.

Repetitive use of a film to trigger discussion is not advisable. Students can become sensitized and sluggish to any unvaried teaching technique.[11] Combining a trigger film with a

lecture may prevent sensitization and improve assimilation of concepts and memory formation. The use of the two teaching modalities together, has not been studied. Finding appropriate, evidence based modalities to develop critical thinking skills for high-risk, low-frequency events a student may not encounter during their training, is essential for the development of the optimally educated nurse anesthetist.

In this study, a trigger film and lecture were used in comparison to traditional lecture alone. The purpose of this study was to ascertain if a SRNA's critical thinking skills are enhanced with the use of lecture in combination with a trigger film over lecture alone, as evidenced by improved scores on the Care of the Malignant Hyperthermia Patient in the Operating Room Evaluation Tool (Appendix A) The research question posed for this project was: Will Student Registered Nurse Anesthetists (SRNAs) who participate in lecture and view a trigger film related to undiagnosed malignant hyperthermia demonstrate enhanced clinical decision making behaviors in the simulation lab versus SRNAs that participate in lecture alone?

LITERATURE REVIEW

Lecture

Lecturing brings little gain in engendering affective learning.[11] This fact is amply verified by research and the experience of generations of teachers. Presenting didactic material in lecture format provides the student with a collection of facts and requires the educator to then navigate with the student through the information.[11] Teaching is a process of generating data within the student; arousing motivation or creating inner tension which enables the modification of the student's behavior.[1]

Trigger Films

The trigger film method has been found to be effective for presenting complex situations to a group of students.[12] Trigger films could be utilized as a reinforcement or remedial tool, for students to review situations that they might otherwise not encounter. This use would stimulate discussions and further questions on the studied topics.

Trigger films that focus on critical events and professional issues in the clinical area will likely have future applications. One such application is research. Future studies could evaluate how both learners and clinicians perform during critical events in a simulated environment. Trigger films could also be instrumental in investigating the relative effectiveness of various ways of managing crisis situations.[5]

Filmed scenarios could easily be integrated into an educational curriculum.[5] The trigger film can be very useful for initiating learning simulations and experiences in which the chief purpose is to generate data within the student as a means toward producing affective behavioral changes.[13] This teaching tool may help to introduce new topics and investigate the outcomes of various approaches to managing patient situations. Trigger films may be particularly effective in the analysis and remediation of clinical, interpersonal and technical scenarios that surface in practice, but which are difficult or dangerous to reproduce in the real clinical environment.[14] They may help educators evaluate retention of learned material, performance of techniques, and to teach alternative approaches to dealing with “real-life” clinical problems. Using trigger films to teach teamwork, effective communication skills and new technologies could improve the teaching dynamic between instructors and students.[14]

Perceived self-efficacy is defined as people's beliefs about their own capabilities to produce designated levels of performance that exercise influence over events that affect their lives.[14] Video

clips provide students the opportunity to replay a scenario many times outside of the classroom environment.[3] This allows time to synthesize those topics that are difficult to grasp.

Often many more questions arise from viewing a trigger film than are answered. Additional questions are considered a positive attribute. The goal of viewing a trigger film is to stimulate the learner's active involvement in the critical thinking process. The use of the trigger film as a type of learning tool places the student in the position of being an active learner. Films present each student with a situation that demands a response. No two discussions initiated by viewing a single trigger film are alike.[5] The combination of a trigger film to introduce a clinical situation with a similar follow-up session in a realistic simulation lab may prove to be a superior approach.

Malignant Hyperthermia

Malignant hyperthermia (MH) is a pharmacogenetic disorder of skeletal muscle that presents as a hypermetabolic reaction to volatile anesthetic gases such as halothane, sevoflurane, desflurane, isoflurane and the depolarizing muscle relaxant succinylcholine. The incidence of MH reactions ranges from 1:10,000 to 1:250,000 anesthetics.[15] However, the prevalence of the genetic abnormality may be as great as one in 400 individuals.[15] If MH is not immediately treated, death will ensue. Since few patients who are MH susceptible display phenotypic changes without exposure to anesthesia, it is impossible to diagnose susceptibility without either exposure to a "triggering" agent or through specific diagnostic testing.[15]

On average, a patient requires three anesthetics before a triggering event occurs, however, this crisis may develop at first exposure to anesthesia. The mortality of MH has dramatically decreased from 70-80% to less than 5%, due to an introduction of dantrolene sodium for treatment.[16] Certified Registered Nurse Anesthetists (CRNAs) may never experience this crisis during their career but, they need to be prepared to recognize and manage it if they do. It is unlikely

that SRNAs will see a MH event during their training. The importance of teaching the recognition, differential diagnosis and correct management of a MH crisis in a manner that students will understand and retain cannot be over emphasized.

Pedagogy

Different technologies in education have benefits and limitations. One of the biggest challenges that nursing educators encounter is how to best help students develop critical-thinking skills so that good, well thought out, clinical decisions are made. Students are more agreeable to learning with varied types of instruction.[17,18,19] Adapting conventional methods of delivery of didactic material to millennial learners has proven a challenge for educators.[2] The use of technology in the classroom is essential to secure attention and meet these students' educational needs. Active involvement increases responsiveness and challenges students to come to class prepared. Technological strategies create improved recall.[2]

Bloom's taxonomy offers a useful classification of the intellectual processes essential to learning.[9] Lower order skills, such as remembering and understanding, can be facilitated with traditional classroom methods. Creating learning activities that aid in the development of higher order skills is more difficult and requires educators to engage students in a participatory experience. Critical thinking skills may be enhanced in students exposed to filmed vignettes by creating an atmosphere that promotes vicarious learning.[9]

Simulation

Objective evaluation of clinical competence in nursing students is a major challenge for nurse educators.[20] With limited sites for clinical placements and varying clinical hour requirements, students may not have sufficient opportunities to integrate classroom content into clinical performance.[21] Clinical simulation plays an increasingly important role in health care

education and training. Ample research demonstrates effectiveness of simulation-based experiences for skill training, leadership development, communication practice, critical thinking development and interprofessional team training.[22]

Providing an arena to experience high-risk, low frequency scenarios for students, simulation is becoming commonplace in nursing education. High fidelity human simulators (HFHS) are highly technical mannequins used to encourage learning by immersion in a patient-centered event. Program directors are increasingly incorporating high fidelity human patient simulators into their curricula.[10] Simulation fosters critical skills not readily acquired through traditional approaches. Students are allowed to make mistakes, even those leading to the simulated patient's demise, without fear of retribution. The scenarios present evaluation opportunities not possible in the classroom or clinical arena. The scenarios assist educators in addressing external realities that impinge on the formation of safe, competent nurse anesthesia graduates.[10] Immersion in a simulation scenario provides the opportunity for educators to evaluate a student's knowledge and concept synthesis in a realistic but non-threatening environment.

Outcomes-based education has become a focus in healthcare profession education. There has been increasing demand to provide evidence that learning has occurred.[23] Healthcare simulation, integrated into the larger healthcare education curriculum, is currently being used to provide this evidence, specifically with a focus on observed evidence of competencies.[24] Competence includes a broad range of knowledge, attitudes and observable patterns of behavior which together, account for the ability to deliver the specified professional service which is under evaluation.[25]

Generally, there are two types of assessment. Formative assessment evaluates learning with quizzes, question and answer, or classroom discussion. Summative assessment occurs at the end

of a course or program by collecting, analyzing and summarizing abilities so that competence of the learner can be decided. During a simulated scenario, learners are observed and then provided feedback on how they performed during subsequent debriefing. Formative assessment serves to inform the learner and the educator on how to achieve learning for each individual.[24] Summative assessment serves to inform the educator on whether or not the learner is competent to pass a level of competence.[24]

THEORETICAL FRAMEWORK

Allan Paivio's Coding Theory was the theoretical framework utilized for this study. This theory looked at both the verbal and visual cognitive processes that are utilized in learning. It suggests that these processes are separate but somehow interrelated.[7] Allan Paivio's Coding Theory discusses the use of visualization and how it enhances learning and recall, because images and words are processed at different sites in the central nervous system.[9] The use of visual elements in education enables the educator to tell a story, an advantageous teaching tool. In testing this framework, the primary investigator utilized printed PowerPoint slides as the written side of this theory and trigger films as the visual side. Together they tell the story.

MATERIALS AND METHODS

Study Design

The proposed research question was evaluated using an experimental research design. The use of trigger films in combination with lecture versus lecture alone on the subject of malignant hyperthermia was investigated.

Setting

The Marcia & Eugene Applebaum Simulation Learning Institute at Beaumont Hospital, Royal Oak, one of the most advanced medical simulation facilities in North America, was the

primary site for data collection. This educational facility was developed to transform the way health care professionals learn and train. The center's administration granted approval for utilization of the center prior to the start of the study. No cost was incurred for usage of the center. Video production for development of the MH trigger film at Beaumont Health was requested and approved at no cost.

Ethics

Following approval from the IRB at both Oakland University-Beaumont and the University of Michigan-Flint (Appendix B), all students participating in the study were provided with an informational page pertaining to the study (Appendix C). A senior SRNA, who had been trained and certified through Beaumont Health's consenting certification class to deliver consent information for IRB approved research studies, delivered the informational page to students in the Royal Oak, MI classroom. Students at distant sites (Kalamazoo, MI and Marquette, MI) were emailed the informational page immediately prior to the SRNA's explanation. The SRNA's explanation was seen and heard by distance student via a telecommunication system. Distance students were required to fax the form back to the sender upon completion of the explanation. The information sheet was read aloud, simultaneously, to all students. Students were then given one hour to read the information sheet and to ask questions. A "Receipt of Information Sheet" was used to track participants who agreed to participate in the study (Appendix D).

Population

Twenty-three SRNAs (Class of 2018) enrolled in the Oakland University-Beaumont Graduate Program of Nurse Anesthesia received a lecture on malignant recognition, diagnosis and treatment during the first semester. These students also received lectures on anaphylaxis and bronchospasm. The lecture provided foundational knowledge regarding the appropriate diagnosis

and treatment of a malignant hyperthermia crisis. To negate systematic bias, students were randomly divided into two study arms following receipt of the three lectures. This randomization was done utilizing the Research Randomizer program.[26]

Enrolled participants subsequently participated in a simulated scenario alone, independent of one another, in the same simulated operating room, under congruent conditions over a two week time period. Identical scripted scenarios were utilized by the actors for each scenario. The investigator of the study ran the computerized portion of the scenario and controlled the hemodynamic responses associated with the SRNA's clinical decisions, following a previously developed protocol. The scenarios were conducted utilizing the SimMan® and the designed scenario algorithm (Appendix E).

Implementation

Twenty-three students from the Oakland University-Beaumont Graduate Program of Nurse Anesthesia Class of 2018 were randomly assigned to one of two groups, Group A and Group B. Twelve students were randomized to Group A and 11 students to group B. One student declined to participate in the study after randomization and was removed from the analysis. This allowed for 11 students in Group A and 11 students in Group B.

Prior to the start of the study, the principal investigator developed and filmed a MH trigger film in the Applebaum Surgical Learning Institute (SLI). The trigger film depicted a patient exhibiting signs and symptoms of a malignant hyperthermia crisis while undergoing surgery and a CRNA's diagnosis and treatment of this syndrome. Senior students in the Oakland University-Beaumont Graduate Program of Nurse Anesthesia student leadership group played clinical roles in the film. The principle investigator wrote the script. Student research subjects were not informed which of the three scenarios would be simulated.

Following IRB approval from Beaumont Health's institutional review board as well as University of Michigan Flint's review board, a meeting was held to present information about the study to potential student participants. Participating students were required to review a confidentiality contract that they originally signed on admission to the nurse anesthesia program located in their student handbook (Appendix F). Likewise, the previously signed nondisclosure agreement, including the possibility of sanctions, was reviewed and reinforced. Students were asked to re-sign the form indicating their agreement not to share simulation scenarios with other participants.

Immediately preceding each student's simulated scenario, Group A students viewed three videos (MH, bronchospasm and anaphylaxis). Group B students reviewed three Powerpoint presentations made from the previously attended lectures on the same subjects. Anaphylaxis and bronchospasm videos, created by Kaiser Permanente's School of Nurse Anesthesia, were retrieved from YouTube and viewed by Group B. Film viewing took place in an isolated area (Area B) within the SLI. After viewing the trigger films, each student proceeded to OR 1 in the SLI to participate in the MH scenario. Upon arrival to Area B, Group B students were allowed time to review the lecture Power Points slides pertaining to MH, anaphylaxis and bronchospasm. Each student then proceeded into OR 1 to participate in the simulated experience. Both groups were given the same, scripted prebriefing (Appendix G) prior to entering the OR. Any questions that students had were answered before they entered the OR.

Each participant was given a case description and had 15 minutes to set up the OR for the case (Appendix H). Each simulation session was videotaped via the B-Line video system. Students were given 30 minutes after videotaping began to complete the scenario. Following scenario completion, students were asked to fill out a demographic information sheet (Appendix I).

Two independent evaluators reviewed each videotaped session utilizing the Care of the MH Patient in the Operating Room Evaluation Tool (Appendix A). Each evaluator viewed the videotaped simulation sessions and recorded time to diagnosis of symptoms and time to onset of treatment. All video tapes were kept secure on the B-Line videotaping system with access requiring user names and passwords specific to each user. The Mann-Whitney-Wilcoxon rank sum test, a nonparametric test for two population's means based on two independent samples, was utilized to compare the two group's times to decision at a 5% level of significance. A conceptual model is provided as an overview of the study design (Figure 1).

Figure 1. Conceptual Framework illustrating methodology

RESULTS

The average of the two evaluator's blinded scores was utilized for analysis. Symptoms/variables studied are described in Table 1.

Table 1. Symptoms and Variables Studied

Symptoms	**Treatments**
Increase ET CO_2	Alerts Circulator
Rhabdomyolysis	Calls for assistance
Myoglobinuremia	Alerts surgeon of MH crisis
	Stops anesthetic gas
	Ventilates patient with 100% oxygen
	Administers Dantrolene 2.5mg/kg
	Verbalizes appropriate number of syringes of Dantrolene
	Verbalizes appropriate dilution mixture of Dantrolene
	Requests appropriate lab (K)
	Requests cooling measures
	Demonstrates proper treatment of hyperkalemia with insulin 10 units and 50% Dextrose
	Notifies MHAUS

Table 1. Variables reviewed by blinded evaluators for analysis

The side-by-side dot plot shown in Figure 2, demonstrates the general level of each variable and its variation for the two groups of subjects.

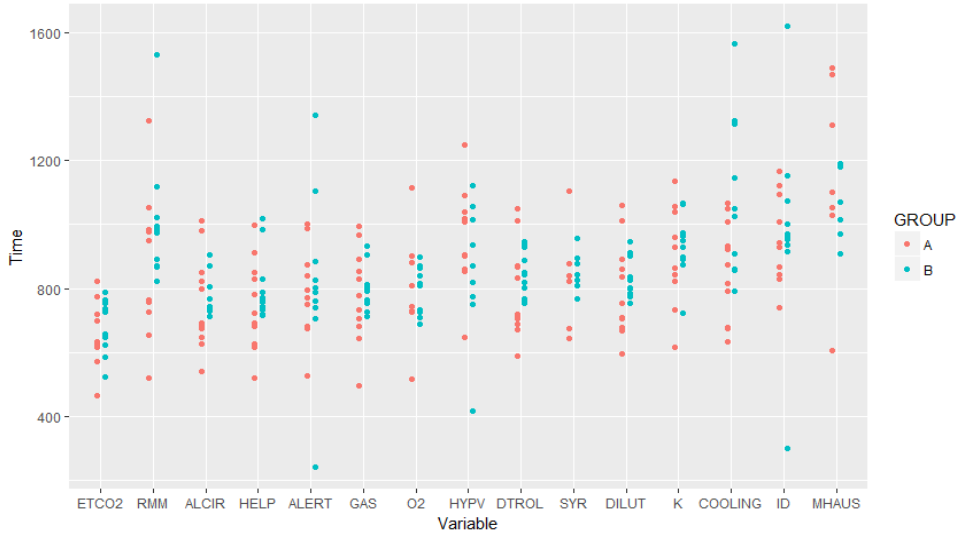

Figure 2. Side-by-side dot plot representing measured variable on the x-axis with time represented on the y-axis.

A Mann-Whitney-Wilcoxon rank sum test was chosen because each group contained 11 subjects, a relatively small sample size. Qu Xianggui, professor of Mathematics at Oakland University in Rochester, MI, performed the analysis utilizing R software. Numerical summaries (in seconds), where SD stands for standard deviation, are provided in Table 2.

	ETCO2			**RMM**			**ALCIR**		
	Mean	***Median***	***SD***	***Mean***	***Median***	***SD***	***Mean***	***Median***	***SD***
Group A	655	631	103	871	857	232	757	692	149
Group B	679	659	82	1008	979	204	778	757	64

	HELP			**ALERT**			**GAS**		
	Mean	***Median***	***SD***	***Mean***	***Median***	***SD***	***Mean***	***Median***	***SD***
Group A	748	725	141	791	784	145	780	780	147
Group B	803	765	103	820	795	282	794	792	71
	O2			***HYPV***			***DTROL***		
	Mean	***Median***	***SD***	***Mean***	***Median***	***SD***	***Mean***	***Median***	***SD***
Group A	803	778	173	957	956	162	793	721	146
Group B	801	815	74	863	873	210	845	843	71
	SYR			**DILUT**			**K**		
	Mean	***Median***	***SD***	***Mean***	***Median***	***SD***	***Mean***	***Median***	***SD***
Group A	827	832	165	798	754	147	900	897	157
Group B	854	843	62	834	828	61	930	931	94
	COOLING			***ID***			***MHAUS***		
	Mean	***Median***	***SD***	***Mean***	***Median***	***SD***	***Mean***	***Median***	***SD***
Group A	859	874	153	954	936	140	1151	1103	306
Group B	1084	1037	250	988	966	319	1056	1043	112

Table 2. Numerical summaries (in seconds), where SD stands for standard deviation

Provided in Table 3 are the definitions for Table 2 variables.

Variable	Abbreviation
ET CO_2	End Tidal Carbon Dioxide
RMM	Rhabdomyolysis
ALCIR	Alerts Circulator
HELP	Calls for help
ALERT	Alerts surgeon of MH crisis
GAS	Stops anesthetic gas
O2	Ventilates with 100% oxygen
HYPV	Hyperventilates patient
DTROL	Administers Dantrolene at 2.5mg/kg
SYR	Reports the correct number of Dantrolene syringes
DILUT	States the correct steps for dilutions of Dantrolene
K	Requests labs
COOLING	Requests cooling mechanisms
ID	Demonstrates proper treatment of hyperkalemia with insulin 10 units and 50% Dextrose
MHAUS	Notifies MHAUS

Table 3. Glossary of Abbreviations

Statistical analysis showed no difference in mean time to decision making between groups at the 5% level of significance for any variable except cooling. Request for cooling demonstrated a P value of .0305, revealing Group A had a shorter mean time to decision than group B. Group

A mean time to initiating cooling was 859 seconds compared to 1084 seconds for group B. Mann-Whitney-Wilcoxon rank sum test scores are displayed in Table 4 for each variable.

Variable	**Mann-Whitney-Wilcoxon rank sum test P value**
ETCO2	0.2339
RMM	0.0951
ALCIR	0.2131
HELP	0.1658
ALERT	0.3697
GAS	0.4235
O_2	0.4344
HYPV	0.2001
DTROL	0.1085
SYR	0.2669
DILUT	0.1658
K	0.2631
COOLING	0.0305
ID	0.2644
MHAUS	0.1830

Table 4. The Mann-Whitney-Wilcoxon rank sum test p-values

Demographic data collected revealed that of the 22 students, one student had previous experience with MH. This student did not demonstrate a statistically significant decrease or increase in time to recognition of symptoms and/or treatment of the MH crisis when compared to his/her peers.

Students were asked to describe their learning style on the post simulation session information sheet. Each student was asked to choose one of seven learning styles which most

closely describes their preference. Table 4 describes their options and results. Because a number of students selected more than one learning style, statistical analysis was not possible.

Learning Style	Learning Style Definition	Number of Students
Visual (Spatial)	Prefers using pictures, images, and spatial understanding	9
Aural (auditory-musical)	Prefers using sound and music	0
Verbal (linguistic)	Prefers using words, both in speech and writing	4
Physical (kinesthetic)	Prefers using your body, hands and sense of touch	7
Logical (mathematical)	Prefers using logic, reasoning and systems	5
Social (interpersonal)	Prefers learning in groups or with other people	2
Solitary (intrapersonal)	Prefers to work alone and use self-study	2

Table 4. Participant's Self-described Learning Styles *Adapted from Salem A., 2015 (25).*

DISCUSSION

New technologies are revolutionizing healthcare education across many disciplines. Simulation is not new to healthcare education yet new technology has allowed simulators to replicate human physiology in a realistic manner.[17] The challenge for educators is how to best utilize simulation in the preparation and evaluation of SRNAs. Could trigger films enable a student to demonstrate enhanced decision-making skills in the clinical setting. The trigger film appears to be an appropriate method to utilize in the effort to create this ideal learning environment.[28] They provide an innovative way to keep students engaged. Easily distracted and exhausted learners need a variety of teaching modalities. Finding appropriate, evidence-based modalities to develop critical

thinking skills in anesthesia is essential for the development of optimally educated nurse anesthetists.

In this study, time to symptom recognition and time to treatment was investigated to test this theory. Utilizing a simulation checklist for evaluation, evaluators documented the times students spent in recognizing symptoms and making treatment decisions.

Following completion of data collection, both groups of students were shown the bronchospasm, anaphylaxis and malignant hyperthermia PowerPoint slides and trigger films to ensure complete education. Group B's review of the films revealed a perception that if they had been shown the trigger films they would have noted symptoms and treated those symptoms earlier and with more accuracy than they were able to with review of PowerPoint slides alone. The trigger film group reinforced this suggestion, remarking that they were pleased with the group that they had been randomly placed into.

Two students verbalized that they were speaking for the class when they indicated that they would like to see trigger films used for more situations. Not only did they verbalize their thoughts on the benefit of high-risk, low-frequency films for more situations, they also suggested that the use of trigger films would be beneficial for more routine learning experiences such as pre-op assessment and anesthesia induction. This conversation prompted further conversations regarding the benefits of viewing anesthesia related trigger films throughout nurse anesthesia education. Interestingly, students from the senior simulation leadership group, who assisted in the development of the malignant hyperthermia trigger film and served as actors in the scenario for this project, felt that their participation in the film serendipitously enhanced their own learning and retention of malignant hyperthermia symptoms and treatment.

Educational research has demonstrated that student learning styles and educators' consideration of learning styles significantly influence the academic success of adult learners.[29] Differences in personal preferences concerning how to receive and assimilate information must be addressed for students' retention of learned material. Consideration of varied learning styles is important in the teaching process to provide the most productive, efficient, and effective nursing education with the greatest potential for student success.[29]

Students in this study were asked to choose one of five different learning styles that best described their style of learning. The primary investigator expected that visual learning would correlate to better scores for those in the trigger film group and that analytical learning would show better scores in the PowerPoint group. Unfortunately, it was difficult to analyze which form of education was beneficial to which type of learner due to the students' failure to follow directions on their demographic information sheet.

Smartphones and tablets have taken a central place in the lives of health care professionals. Their use has dramatically improved communication and has become an important learning tool as medical information can be accessed online at any time. Smartphones are being used for accessing medical diagnostic, treatment and drug information. It is common practice for surgeons to use mobile devices and personal digital assistants (PDAs) in operation theatres for professional purposes.[29] Books and papers to retrieve unknown information on dosing or patient care, in general, are no longer utilized. Students today use a variety of phone apps to not only validate their decisions, but to simply arrive at a decision.

During this study, an unexpected development occurred. Six students used their Smartphones to look up treatment protocols during the malignant hyperthermia simulated scenario. Three students from Group A and three students from group B made the decision to consult their

phones for information on how to treat the MH crisis presented. Realizing that this is a real life possibility, and given the fact that no instruction was given forbidding smart phone use, this was allowed.

Limitations

The sample size in any study dictates the amount of information that is available and determines the precision or level of confidence that the sample estimates. The small sample size in this study inhibited the ability to determine statistical significance. This study was underpowered due to the sample size of 22 participants. Ideally, this study would have contained students from more than one educational program to allow for statistically significant findings.

The likelihood of learning is enhanced by organizing the learning experience, making it meaningful and pleasurable, recognizing the role of emotions in learning, and pacing the teaching session in keeping with the learner's ability to process information.[30] Students in the PowerPoint group verbalized their inability to concentrate in the conference area. Multiple learners utilize the space surrounding the conference area which was utilized for the viewing of the PowerPoints and trigger films. These learners, from various disciplines, were present and conversing with one another in an adjoining area in close proximity during the timeframe when Group B was reviewing the PowerPoint slides. They were asked to keep their voices down, however the request was not granted for any length of time after repeated requests.

Students in the PowerPoint group felt that the PowerPoint slides lacked any intriguing information and were presented in a boring, mundane manner. This, coupled with the extraneous noise in the immediate area, caused many to report decreased ability to concentrate and therefore learn and retain the information. Retention of the information, time to symptom recognition and treatment decisions could have been negatively influenced due to this environment.

All simulation sessions were conducted over a 2-week period. Those who participated in simulated scenarios last had two additional weeks to study the material as compared to the students who participated in the scenarios first. This is an additional limitation of the study design.

Study Strengths

Participants' anecdotal notes following the viewing of both modalities reflect their desire for more interactive learning and their feelings of enhanced learning and retention when this occurs. Larger studies, incorporating an increased number of SRNAs, might be able to validate this.

Data collection instruments and the procedure of data collection in this study measured all the important characteristics with reasonable accuracy. The number of variables did fulfill a desire for completeness when evaluating all aspects of decision making during an episode of MH. Decreasing the number of variables might strengthen this accuracy. Both evaluators remarked that it was, at times, overwhelming to them. Trying to retrieve times for the numerous variables requested proved taxing and left room for error in interpretation.

Dissemination

Dissemination of the study Trigger Films and Simulation: Educating Nurse Anesthesia Students occurred in the form of a PowerPoint presentation at the Fall 2017, Michigan Association of Nurse Anesthetists meeting in Grand Rapids, MI.

CONCLUSION

Patient safety and education are aspects of anesthesia that undergo constant scrutiny and evaluation. The assurance of confident decision-making and strong foundational knowledge is paramount to success. Ensuring this behavior in the most novice practitioners has proven a

challenge for educators. Ensuring enhanced critical thinking skills in high-risk, low-frequency scenarios that might never be encountered during training has proven even more difficult.

Learning is an individual experience. Neuropsychology research is beginning to document the uniqueness of each person's way of actively perceiving and processing information.[30] Students in this study were randomized to either a visual or written teaching construct. It was the goal of this study to reveal, after analysis of student performance, which teaching modality provided enhanced decision-making skills through quicker response times for symptom recognition and treatment in the simulated clinical environment.

Although statistical significance was demonstrated in only one variable, comments made by participating students following the completion of the study reinforced the initial hypothesis that students in the trigger film group believed the films enhanced learning. All students participating in the study reiterated their desire to utilize more trigger films in their educational endeavor. Citing increasing ease of remembering information when viewing the situation played out in actual practice on the trigger film, students verbalized that viewing high-risk, low-frequency scenarios would better equip them to make decisions pertaining to MH diagnosis and treatment in practice.

As a result of and follow-up to this study, Oakland University-Beaumont Graduate Program of Nurse Anesthesia plans to participate in a multi-program study looking at the role of trigger film usage in nurse anesthesia education. Participating universities include Kaiser Permanente, University of Iowa and Bridgeport Hospital Nurse Anesthesia Program. This study is expected to begin during the spring/summer semester 2018.

APPENDIX A

Care of the MH Patient in the Operating Room Evaluation Tool

Criteria used for the Scale (Key)

1 point each (symptom)	Verbalizes recognition of symptoms (RS)
1point each (treatment)	Verbalizes and performs treatment steps appropriately (PT)
1 point for each minute	Time to recognition (TTR)
1 point for each minute	Time to treatment (TTT)

SRNA Name_____

Learner Objective The Learner will:	Content Outline	RS	PT	TTR	TTT
1. Recognize the early and late signs of a Malignant Hyperthermia episode*	1.Signs A. Early signs of Malignant Hyperthermia episode: SRNA identifies 1) Increased End Tidal Carbon Dioxide 2) Masseter muscle spasm-muscle rigidity 3) Unexplained tachyarrhythmia, PVCs, Bigeminy, Sudden Cardiac Arrest from hyperkalemia				

	B. Late Signs of Malignant Hyperthermia: 1) Pyrexia – increase in temperature 1 degree F/3min 2) Coagulopathy-DIC, 3) Rhabdomyolysis – muscle membrane breakdown				
2. Correctly activate a Malignant Hyperthermia Code*	2. Identify the steps for activating a MH Code. A. SRNA alerts the circulator to call for help. B. Calls for the Malignant Hyperthermia Kit				
Learner Objective The learner will:	Content Outline	RS	PT	TTR	TTT
3. Identify the duties necessary during a Malignant Hyperthermia episode*	3. Duties necessary during a Malignant Hyperthermia episode: A. Alerts surgeon of MH crisis B. Stops anesthetic gases C. Ventilates with 100% Oxygen D. Hyperventilates patient E. Administers dantrolene 2.5 mg/kg every 5 minutes up to 10mg/kg ➢ Is able to verbalize number of syringes necessary based on patient weight F. Verbalizes appropriate dilution mixture (mg in 20ml sterile water) G. Places arterial line (May delegate this duty) H. Places second IV (May delegate this duty) I. Requests insertion of Foley catheter J. Delivers cool NS via IV to maintain urine output = 1cc/kg/hr K. Employs cooling measures (ice packs, iced saline lavage) L. Monitors ABGs for ph, K+, CK M. Administers regular insulin & dextrose if hyperkalemic • Pediatric dose: insulin = 0.1 unit/kg, 50% dextrose = 1ml.kg • Adult dose: insulin = 10 units, 50% dextrose = 50ml				

	N. Administers sodium bicarbonate 1-2 mEq/kg for acidosis O. Administers CaCl = 10mg/kg or Calcium gluconate = 10-50mg/kg for life threatening hyperkalemia P. Calls or delegates calling of MHAUS hotline (1-800-MH-HYPER)				
4. Assess effectiveness of interventions and decide if further interventions are needed*	1. Assesses intervention effectiveness A. Reviews labs periodically and evaluates effectiveness of treatment B. Observes temperature increase/decrease and continues with appropriate treatment				
5. Plans for appropriate post-operative care for patient with acute episode of malignant hyperthermia*	1. Communicates with ICU nurse. A. Observe patient in ICU for 24 hours B. Administers Dantrolene for 24 hours ➢ 1 mg/kg every 4-6 hours ➢ .25 mg/kg/hr continuous infusion C. Continues to monitor laboratory values				

APPENDIX B

Research Project

Marion, Julie

Fri 3/17/2017 2:34 PM

To:Rodgers, Laura <Laura.Rodgers@beaumont.org>;

Cc:Medcoff, Caroline <Caroline.Medcoff@beaumont.org>; Cunningham, Denise <Denise.Cunningham@beaumont.org>; Lewis, Bobbie <Bobbie.Lewis@beaumont.org>;

2 attachments

CNR Approval LRodgers 2017.docx; Study Reviews Rodgers 2017.pdf;

Laura:

Congratulations! Your research project: Trigger Films and Simulation: Educating Nurse Anesthesia Students, has been reviewed and approved by the Commission on Nursing Research (CNR).

Attached please find your approval letter. At the completion of your study, or six weeks prior to the one year anniversary of your study approval, you must submit a status report on your study to the CNR. These forms are located on Inside Beaumont under Departments -◊ Nursing -◊ Nursing Research.

Nursing Research approval at Beaumont is a two-step process. A copy of this approval letter has been sent to Beaumont's Institutional Review Board (IRB). Review of your on-line iMedRIS application will determine if the study is considered research. You must submit a iMedRIS Individual Account Request to get access to iMedRIS. You should contact the IRB at (248)551-0662 if you have questions.

Thank you,

Beaumont nurses have magnetism!

Caroline Medcoff, RN, MSN, CNN
Clinical Nurse Specialist
5 Center & 6 Center
phone 248-898-2360
beeper 248-995-9540
cmedcoff@beaumont.org

cc: Denise Cunningham
Bobbie Lewis

Beaumont® | HEALTH SYSTEM

Research Institute
Institutional Review Board

May 01, 2017

Laura A Rodgers, CRNA

Anesthesia & Perioperative Medicine, Nursing

IRB#: 2017-135

Protocol Title: Trigger Films and Simulation

Trigger Films and Simulation: Educating Nurse Anesthesia Students

Sponsor: Investigator Initiated

Dear Laura A Rodgers

It has been determined that the above referenced project involves no more than minimal risk to human participants per the code of federal regulations.

Action: Approved under Expedited Review

Category: Category 6: Collection of data from voice, video, digital, or image recordings made for research purposes
Category 7: Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies

Approval Date: 05/01/2017

Expiration Date: 04/30/2018

Renewal Cycle: 12 months

IRB approval was granted for:

- Information Sheet (dated 04/28/17)
- Demographic Data Sheet (dated 03/26/17)
- Care of the MH Patient in the Operating Room Evaluation Tool (dated 03/26/17)
- Pre-briefing script (dated 03/26/17)
- Randomization Debriefing Script
- Receipt of Patient Information Sheet
- Confidentiality Signature Page

- Consent provider's name: Stephanie Poindexter
- Approved number of participants to be enrolled: 23
- Age range of participants: 26 - 42
- The following Vulnerable Participant Population(s) will be incidentally included as study participants has been determined appropriate:
    - Pregnant Women, Fetuses & Neonates
    - Students/Trainees/Staff

3811 West Thirteen Mile Road Royal Oak, Michigan 48073-6769
248-551-0662

APPENDIX C

Information Sheet

Study Title: Trigger Films and Simulation: Educating Nurse Anesthesia Students

*Principal Investigator: Laura Rodgers*_____

Address: 8176 Sashabaw Ridge, Clarkston, MI 48348_____

Hospital: specify location(s) by checking the box(s)

☐ William Beaumont Hospital (Royal Oak, Troy, and Grosse Pointe)

☐ Beaumont Hospital - Dearborn

☐ Beaumont Hospital - Farmington

☐ Beaumont Hospital - Other _____

Individually and collectively referred to as "Beaumont" throughout this consent.

Purpose:

You are being asked to be in a research study to evaluate your critical thinking skills during simulated high-risk, low-frequency scenarios encountered in anesthesia practice. You were selected as a possible participant because of your status as a 1st year student in the Oakland University-Beaumont Graduate Program of Nurse Anesthesia.

This study is being conducted at William Beaumont Hospital in the Marcia and Eugene Applebaum Surgical Learning Center.

Study Procedures:

If you take part in the study, you will be asked to do the following things:

- Participate in a high-risk, low-frequency scenario event in the simulation lab.
- Agree to be videotaped during the scenario.
- Agree to the utilization of the video tape for evaluation and analysis.
- Complete a demographic data information form at the completion of the scenario
- The time frame necessary for your involvement will be approximately 1-2 hours from pre-briefing through the high-risk, low-frequency scenario to demographic form completion.

- The decision to participate in this study is entirely up to you. You may refuse to take part in the study *at any time* without affecting your relationship with the investigators of this study or Oakland University-Beaumont Graduate Program of Nurse Anesthesia. Your decision will not result in any loss or benefits to which you are otherwise entitled. If you decide not to participate in the study you will still be required to participate in the high-risk, low-frequency scenario at a later date, as it is part of your educational requirement for completion of your MSN degree from Oakland University-Beaumont Graduate Program of Nurse Anesthesia.

Benefits:

As a participant in this research study, there may be no direct benefits for you; however, information from this study may benefit other people now or in the near future.

- The benefits of participation may be to:
  - Demonstrate a more active role in how SRNA's critical thinking skills are best enhanced.
  - Contribute towards the advancement of nurse anesthesia education
  - Benefit future SRNAs by helping educators learn more about the effects of certain teaching modalities on the enhancement of critical thinking skills.

Risks:

Beaumont is committed to upholding strict confidentiality in research and all business practices, however there could be a rare risk of loss of confidentiality. We are very concerned about your privacy and will make every effort to maintain the security of your records.

Costs:

There will be no costs to you for participating in this research study.

Compensation:

You will not be paid for taking part in this study.

Confidentiality: The records of this study will be kept strictly confidential. All information collected from you will be kept securely in a method approved by Beaumont. The investigator

and two evaluator faculty members will have access to video tape recordings through a confidential URL. These video tapes will be used for evaluation purposes only. No information that could identify you will be published in any report.

Voluntary Participation/Withdrawal:

Taking part in this study is voluntary. You may choose not to take part in this study, or if you decide to take part, you can change your mind later and withdraw from the study. Your decision will not change any present or future relationships with William Beaumont Hospital or its affiliates. If you are employed by William Beaumont Hospital or its affiliates, as an employee your participation is completely voluntary and will not impact your job in a positive or negative manner.

Questions:

If you have any questions about this study now or in the future, you may contact Laura Rodgers at laura.rodgers@beaumont.org or by telephone at 248-898-6234, or contact the investigator's faculty, Dr. Shawn Fryzel at sfryzel@umflint.edu or Dr. Jane Motz at jamotz@umflint.edu. If you have questions or concerns about your rights as a research participant, please contact the Institutional Review Board at 248-551-0662. The Institutional Review Board is charged with the oversight of all human participant research conducted at Beaumont facilities.

Participation:

By participating in the high-risk, low-frequency scenario you are agreeing to participate in this study.

APPENDIX D

Receipt of Patient Information Sheet

HIC #:

Study Title:Trigger Films and Simulation: Educating Nurse Aneshtesia Students

I have reviewed the information sheet for this study with the participant (*Enter study ID or name:).* The participant has agreed to participate in the study.

Comments, if applicable:

Name of Person Distributing Information Sheet:Stephanie Poindexter

Signature of Person Distributing Information Sheet:

Date:

APPENDIX E

Designed Scenario

Simulation Preparation

Personnel needed to run Simulation: SRNA Simulator coordinator Surgeon Actor (preferred)
Props MH Box available
Specific Set-up Operating Suite set up Sterile field Anesthesia Equipment 3G SimMan Manikin with IV in place

Patient Status

SimMan Vital	Preprogrammed Starting Vitals	Simulation Start	Critical Change 1	Critical Change 2	Critical Change 3	Critical Change 4	
Basic Heart Rhythm	Sinus Rhythm	Sinus Rhythm	Sinus Rhythm	Sinus Tachy-cardia	Sinus Tachy-cardia	Sinus Tachycardia	
Extrasystole : (Options are : None/Uni focal PVC/Couples PVC/PVC R on T/PAC-PJC)	None	None	None				
Heart Rate	80	85	90	108	115	118	

Blood Pressure : Systolic/Diastolic	120/80	90/50	108/60	118/70	125/80	140/90	
Auscultation Lung Sounds : Options are : Normal/ Crackles/Gurgling Rhonchi/ Pleural Rub/Pneumonia/ Rhonchi/Stridor/Wheezes	Normal	Normal	Normal	Normal	Normal		
Airway : Options are : Normal/Restricted/ Obstruction	Normal	Normal	Normal	Normal	Normal		
Respiration Rate : Breaths/Min	12	10	10	10	10		
Monitor Controls							
SpO2	98	96	97	97	97	96	
$EtCO_2$ (mmHg)	34	36	38	40	41	44	
Tperi (ºC)	36.1	36.4	36.5	36.8	37	37.2	
Pulse Strength		Normal	Normal				

Sim Man Vitals	**Critical Change 5**	**Critical Change 6**	**Critical Change 7**	**Critical Change 8**	**Critical Change 9**	**Critical Change 10**	**Critical Change 11**	**Critical Change 12**
Basic Heart Rhythm	**Sinus Tachy-cardia**	**Sinus Tachy-cardia**	**Sinus Tachy-cardia**	**Sinus Tachy-cardia**	**Sinus Tachy-cardia**	**Sinus Tachy-cardia**	**VFIB**	**SR / BBB**
Extra-systole						**PVC/ COUPLETS**	**VFib**	**SR/ BBB**
Heart Rate	**118**	**121**	**125**	**128**	**130**	**135**	**0**	**44**
Blood Pressure	**140/90**	**150/80**	**145/95**	**150/80**	**170/85**	**180/90**	**none**	**90/50**
Lung Sounds	**Normal**				**diminished**	**absent**		
Lung Functions	**Yes**				**Broncho-spasm**	**Broncho-spasm**		

Heart Sounds	**Normal**							
Respiration Rate	**12**	**10**	**10**	**10**	**10**	**10**	**10**	**10**
SpO2	**96**	**96**	**96**	**96**	**94**	**91**	**Absent**	**92**
$ETCO_2$ (mmHg)	**44**	**45**	**46**	**48**	**50**	**58**	**78**	**68**
Tperi (ºC)	**37.3**	**37.4**	**37.9**	**38.1**	**38.3**	**39**	**40**	**39.5**
Pulse Strength	**Normal**					**Weak**	**Absent**	**Weak**

Planned Progression of Scenario

State/ Timeline	Expected Performance (Learning Objectives)	Achievement of Objective (Trigger to move to next state)	Learning Cues
Simulation Start (Minutes 0 – 5) Induction	***Receive report for the patient*** ***Administer Induction Drugs –*** ***Propofol*** ***Rocuronium*** ***Fentanyl***		
Keystone	***Antibiotic – Kefzol 2gm***		***Student confirms that the patient has no allergies***

Critical Change 1 **Induction: Decrease in BP due to induction drug**	**Recognizes decrease in BP. Diagnoses of induction drug as the causative factor**	**Student perceives decrease in BP as onset of induction agent and prepares for intubation**	**Prepares patient for Laryngoscopy**
Critical Change 2 **Increase in Tachycardia rate** **Increase in EtCo2** **Increasing BP**	**Patient stabilizes with intubation stimulation**	**Student participates in surgical time out**	**Student discusses possibility of MH**
Critical Change 3	**Skin Incision**	**Student views rise in BP/ HR as related to surgical stimulation**	**Student gives narcotic and/or increases inhalation agent in response effects of surgical stimulation**
Critical Change 4	**Surgery ongoing. Student should be assessing and evaluating hemodynamics. Subsequently, should**	**Student may view continuing rise in BP as related to surgical stimulation and young age of patient**	**Student considers/gives narcotic and/or increases the inhalation agent**

	be making changes to combat issues.		
Critical Change 5	**Surgery ongoing. Student should be assessing and evaluating hemodynamics. Subsequently, should be making changes to combat issues.**	**Student notices the increase CO_2 in TV by this point.**	**If not already done student should be adjusting the TV and/or RR upward to decrease CO_2**
Critical Change 6	**Surgery ongoing. Student should be assessing and evaluating hemodynamics. Subsequently, should be making changes to combat issues.**	**Student continues to assess hemodynamics.**	**Student makes adjustments with narcotics, TV, RR, Inhalational gases.**

Critical Change 7	**Surgery ongoing. Student should be assessing and evaluating hemodynamics. Subsequently, should be making changes to combat issues.**	**Student is aware of decreasing O_2 Saturation.**	**Student assesses circuit for leaks, listens to breath sounds.**
Critical Change 8 **Increase in Tachycardia** **Increase in $EtCO_2$** **Increasing BP**	**Recognizes increase in $EtCO_2$ and considers MH diagnosis** ***Calls for help*** **Discontinues triggering agent** **Administers 100% FiO_2 with Ambu bag** **Hyperventilates**	**Student calls for MH box (If student does not recognize this hemodynamic instability as MH proceed to frame 11)**	**Student discusses possibility of MH**
Critical Change 9 **Bronchospasm** **BP 80/40** **HR 120**	**Student recognizes decreases O_2 saturation**	**Student gives albuterol via endo tube.** **Has help in room drawing up Dantrolene. Explains the correct way to mix Dantrolene and administers appropriate number of 20 cc syringes.**	**Student asks extra anesthesia staff to start an arterial line and begins to send off serial labs:** **ABGs** **K** **Ca** **Glucose** **Begins cooling measures**

Critical Change 10	**Student continues with MH protocol**	**Administers Dantrolene 2.5mg/kg every 5 minutes up to 10mg/kg** **Delivers cool NS via IV to maintain urine output = 1cc/kg/hr** **Employs cooling measures** **Monitor ABGs for ph, K+, CK** **Considers arterial line placement** **Administers regular insulin & dextrose if hyperkalemic** **a. Pediatric dose: insulin = .1 unit/kg, 50% dextrose = 1ml/kg** **b. Adult dose: insulin = 10 units, 50%dextrose = 50ml** **Administer sodium bicarbonate 1-2 mEq/kg for acidosis** **Administer CaCl = 10mg/kg or Calcium gluconate = 10-50mg/kg for life**	**Student institutes Post-operative care for the Patient** **c. observe patient in ICU for 24 hours** **d. Administer Dantrolene for 24 hours (1mg/kg every 4-6 hours) (.25 mg/kg/hr continuous infusion)** **e. Continue to monitor laboratory values** **(If MH is still not recognized Student will need to recognize the need for CPR)**

		threatening hyperkalemia Call MHAUS hotline (1-800-MH-HYPER)	
Critical Change 11	**Lab values are given to student**	**Provides insulin, D5 Sodium Bicarb, CaCl or gluconate per protocol**	**Patient's hemodynamic profile improves.**
Critical Change 12	**Unrecognized MH leads to Ventricular Fibrillation (VF) in this patient**	**Student recognizes VFIB**	**Student calls for Defibrillator, starts CPR and begins ACLS protocol.**
Critical Change 13		**Student institutes Post-operative care for the patient.** • **Observe patient in ICU for 24 hours** • **Administer Dantrolene for 24 hours** *** (*1mg/kg every 4-6 hours or .25 mg/kg/hr continuous infusion)***	

Morgan, Mikhail, Murray. Clinical Anesthesiology, 3rd edition.

Appendix F

Oakland University-Beaumont

Graduate Program of Nurse Anesthesia

Signature Page

I have received a copy of the Oakland University – Beaumont Graduate Program of Nurse Anesthesia Student Handbook for students entering in September of 2015. I have had an opportunity to review and discuss its contents and I agree, as a student enrolled in this program, to adhere to the policies and guidelines set forth.

I am aware that simulation learning is a required component of the program and all instructional direction, discussion, practice and testing are confidential.

I agree not to share any information used during the simulation session with anyone. I understand that I may be videotaped during these sessions and that it may be used for educational and testing purposes.

I agree to comply with student responsibilities as stated in the Standards of Conduct for the Clinical Instructor Student Relationship.

I agree to comply with Social Media Policy Guidelines as stated with the Beaumont Health System and Oakland University Guidelines.

I am aware that program faculty reserves the right to revise all information in this handbook at its discretion and to make reasonable changes in requirements to improve the quality of education or upgrade the program.

(Name) (Date)

APPENDIX G

Pre-briefing Script

Welcome Participant [*Provide the same instructions for each scenario enactment*]	
Introduction of scenario	1. Hello (Student's Name) _____ 2. Today you will be taking part in one of the just reviewed high-risk, low-frequency simulated scenarios. 3. This is the patient's chart. (Appendix A) 4. Remember that SimMan's tidal volumes can only be set at 350ml and requires your gas flows to be at 8liters. 5. As is always the case, masks and hats can be found directly outside of OR 1. 6. Gloves can be found on the back of the cart. 7. Student actors will be participating in the role of surgeon and scrub tech. 8. If you should need to call for help for any hospital personnel please utilize the phone located on your cart. For purposes of this simulation as with simulations that you have previously been involved in, an anesthesiologist will be present in voice only. 9. As with previous simulated scenarios that you have participated in, if you need any equipment that is not readily available to you, utilize the phone on the back cart and call for what you need. The device/equipment will either be supplied or you will be instructed to "pretend" for simulated purposes. 10. If at any time the SimMan mannequin is not behaving appropriately due to an equipment malfunction, I will let you know what is the issue and you will be asked to continue on with the scenario.
Schedule	1. The scenario will be taking place in OR 1. 2. You will have 15 minutes to complete the set-up of your room. 3. At that time if you have any questions you will be allowed to ask them. After that time period no further questions may be asked until the end of the scenario.

Scenario	1. Verbalize every diagnosis you decide on. 2. Verbalize every intervention as you intervene 3. Speak loudly with each diagnosis and intervention so that your voice can be heard on the videotaped recording.
Completion	1. Following the scenario there will be a debriefing where we will discuss the scenario and your role in it. 2. At the completion of the debriefing there is a short questionnaire for you to fill out prior to leaving the surgical learning center. 3. Please give this questionnaire to the senior simulation leadership student standing at the back doors. 4. You will leave the surgical learning center via the back doors.
Consent forms	
	If you have received the previously presented informational sheet you will be taking part in a studied high risk/low frequency high-risk, low-frequency scenario. As previously explained, this page along with the signed receipt of information sheet, shows that you gave your permission to participate and to be video recorded during the scenario for study purposes. If you have not received the informational sheet and/or have not signed the receipt of information sheet, you will still be participating in the scenario and will still be videotaped for educational purposes, however, your participation will not be included in the study.

APPENDIX H

Case Description/Chief Compliant
Patient Name: John Smith
Relatives Present: Mother/Father
CSN: 123456
Age: 16 year old
Height/Weight: 5’11” / 185 pounds
Language Spoken: English
Past medical: Asthma as a young child Surgical History: none Present Complaint: Torn ACL Surgery Scheduled: ACL repair

APPENDIX I

Student Name _____

Demographic Data

Please answer the following 6 questions:

1. Female _____ Male_____
2. ICU experience (in years) prior to admission into the OUBGPNA program_____
3. Previous OR experience (in years) _____
4. Previous simulation experience prior to anesthesia school

Yes_____ No_____

5. Current GPA_____
6. Previous experience with Malignant Hyperthermia

Yes_____ No_____

7. How would you describe your learning style? (Circle One)
    - **Visual (spatial):** You prefer using pictures, images, and spatial understanding.
    - **Aural (auditory-musical):** You prefer using sound and music.
    - **Verbal (linguistic):** You prefer using words, both in speech and writing.
    - **Physical (kinesthetic):** You prefer using your body, hands and sense of touch.
    - **Logical (mathematical):** You prefer using logic, reasoning and systems.
    - **Social (interpersonal):** You prefer to learn in groups or with other people.
    - **Solitary (intrapersonal):** You prefer to work alone and use self-study.[25]

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