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A Competence-Based Online Learning Video and In-Situ Simulation to Improve Perioperative Anesthesia Nurse Practitioner Self-Efficacy in Responding to Anesthesia Emergencies

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A COMPETENCE-BASED ONLINE LEARNING VIDEO AND IN-SITU SIMULATION TO IMPROVE PERIOPERATIVE ANESTHESIA NURSE PRACTITIONER SELF-EFFICACY IN RESPONDING TO ANESTHESIA EMERGENCIES

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Abstract

Background: Nurse Practitioners (NPs) are broadly educated to the population-based role in which they practice. Further education in subspecialties is essential as more NPs are working autonomously in highly specialized care areas.

Problem: In the Department of Anesthesia at a large urban hospital, perioperative anesthesia NPs lack formal training in the subspecialty of anesthesia, which contributed to a lack of self-efficacy when responding to anesthesia emergencies.

Methods: An asynchronous multimodal brief instructional video accompanied by an in-situ simulation of an anesthesia emergency was developed to increase knowledge and confidence in perioperative anesthesia nurse practitioner response to anesthesia emergencies.

Results: A total of 8 perioperative anesthesia NPs (73% of the staff) participated in the multimodal educational intervention, and 100% of the participants experienced an increase in knowledge to locate emergency anesthesia equipment, along with increased confidence levels in responding to an anesthesia emergency scenario after watching the video and performing the in-situ simulation.

Conclusion: Deploying a multimodal educational video along with an in-situ simulation was effective in increasing participant's self-efficacy when responding to an anesthesia emergency, and was found to be feasible. Inadequate educational resources, poor inclusivity of the NPs in the culture of education, and limited time allotted for education were addressed by providing open access of the video on the internet. In-situ simulation reinforced education through a realistic hands-on scenario and provided repetition with the use of Rapid Cycle Deliberate Practice.

Introduction

Description of the Problem

Advanced Practice Nurses in sub-specialty areas such as anesthesia do not always have formal education that prepares them to practice in these highly specialized, high acuity and complex patient care areas. The Consensus Model for Advanced Practice Registered Nurse (APRN) Regulation provides the framework and overarching model for the advanced practice nursing role delineation and education. Specifically, the document, called the LACE model (Licensure, Accreditation, Certification, and Education) was developed in conjunction with multiple nursing associations to create a model to reduce discrepancies or variations in the education of APRNs, along with providing a guideline for regulation of APRNs and their scope of practice across the U.S. (Consensus Model, 2008). The main APRN licensing roles are either as a nurse anesthetist, nurse midwife, clinical nurse specialist, or nurse practitioner (NP). Within these roles the APRN is trained with a population focus including, family, adult/geriatric, pediatric, neonatal, women's health, acute care, or psychiatric health. Outside of these population foci, education and certification in sub-specialties remain at the discretion of the APRN, or the needs and requirements of a population or institution. Post certification training in subspecialities is mostly conducted through an apprenticeship process at the place of practice without standardized training or certification requirements for practice. As more NPs are hired to work in highly specialized, higher-acuity areas with increasing autonomy, the need for post-graduate subspeciality training is critical.

Local Problem

At the hospital where this quality improvement project took place, NPs are employed by the Department of Anesthesia with the intention of providing support and continuing care across

the perioperative period, including pre and post procedure. NPs who work in the department are trained in the population foci of either family, adult/geriatrics, or acute care and have been prepared to specialize in perioperative care through a brief informal apprenticeship or orientation. The perioperative anesthesia NP evaluates and orders specific medications during the preprocedural phase and are available for postprocedural orders or evaluation. Infrequently, an intraprocedural adverse event occurs and the NP may be the first to respond when help is requested, specifically in remote procedural rooms which are located distantly from general operating rooms. These remote areas include gastroenterology suites, electroconvulsive therapy units, or cardiac intervention procedural areas, and additional anesthesia provider support is not readily available. Therefore, the Anesthesia Quality and Safety Initiative, anesthesia leadership, and the perioperative anesthesia NPs have identified anesthesia emergencies as an area in which additional training would be beneficial.

Several factors contributed to the perioperative NPs feeling ill-prepared to respond to anesthesia emergencies (see Appendix A). The most salient issue was the lack of education focused on anesthesia-related emergencies. The lack of time and flexibility during work hours, along with limited availability of instructors was identified as an issue. Limited availability of procedural rooms for real-time demonstration, along with the inability to convene the entire perioperative NP group was another concern. Currently, the culture of education in the department emphasizes resident and physician education, and limited online access for the NPs has been identified as a barrier to learning. When an anesthesia emergency occurs, there is no debriefing or discussion as to what could have been done to improve the emergency response, and what could be learned from the experience.

Available Knowledge

A PRISMA guided systematic search of the literature was conducted to investigate the most effective online learning strategies for APRNs or NPs in a clinical environment. CINAHL, PubMed, ERIC were the primary search engines, and a total of 51,613 articles were initially identified. Publishing date limitations were applied, and articles were narrowed to peer-reviewed, English language, which yielded 716 articles. This group was then further limited to the following terms: “nurse practitioner,” “advanced practice nurse.” Fifteen studies were handpicked from that group for further review, including two randomized control trials, four quasi-experimental trials, three nonexperimental studies, and two mixed-method research articles. Non-research evidence was also searched, and three systematic reviews were identified. The studies were sorted into three thematic areas including asynchronous online learning, synchronous online learning, and in-situ simulation. A table synthesizing the evidence is in Appendix B.

Asynchronous Online Learning

Asynchronous learning is online education, which is self-paced, done independently, and has been more accessible as mobile devices have become more available. Increased flexibility and access to online educational content is a reason to utilize this mode of learning in healthcare. There is limited interactivity with others during asynchronous learning, but its effectiveness has been documented with improvement in knowledge scores in pre and post testing with an educational video as the sole learning tool in healthcare (Zhang, et al., 2012; Lee, et al., 2015). The use of online content immediately prior to performing a procedure, otherwise known as “Just-in-Time” training has been effective in reducing the time used to perform an action such as volar splinting or chest tube insertion when a video was viewed prior to completing the task (Brown, et al., 2021; Davis, et al., 2012; Lee, et al., 2016). Similarly, a brief educational video on

urinary catheterization techniques was found to reduce procedure time and improve performance in the action (Lee, et al., 2016). Another study found that the level of interactivity involved in an asynchronous educational video impacts learning. Zhang & Chawla (2012) compared post-video levels of efficacy in performing a physical examination after one group of students watched a video demonstrating correct techniques while another group watched the same video along with a video demonstrating incorrect techniques. Although both groups of students exhibited significant improvements in knowing how to perform a physical examination, the group who were able to compare the correct actions and incorrect actions demonstrated higher post-educational knowledge scores (2012). This suggests that having increased viewing interactivity engaged the students in the learning process and impacts knowledge (2012; Leszcynski, et al., 2018).

The use of multimodal online learning modules involving verbal instruction, graphics and demonstration is another method of self-directed asynchronous leaning. The use of multimodal online instruction improved emergency nurse self-efficacy and knowledge of rapid-sequence intubations, which the nurses previously reported poor confidence in prior to the study (Hersey & McAleer, 2017). The visualization of equipment through online video demonstrations and interactive elements increased confidence in real-time scenarios by increasing learner engagement (2017). Similarly, another study concluded that the use of a generalist, multidisciplinary self-learning module to teach a rapid cardiac intervention pathway improved post-test knowledge scores in clinicians with limited emergency or critical care backgrounds, such as internal medicine physicians and nurses (Hartman, et al., 2018). However, low pretesting knowledge appeared to be associated with poor knowledge scores in post-tests, (Sinclair et al.,

2019). Although there was an improvement in knowledge after the online course, scores on posttests remained low (2019).

Satisfaction was consistently higher with asynchronous videos and online learning courses versus traditional online reading (Leszcynski, et al., 2018; Hersey & McAleer, 2017; Atack, et al, 2012; Sinclair et al., 2019). Increased satisfaction with online learning was associated with students who had higher pretest skills and knowledge from the beginning of the study (2012). Garcia et al. (2020) assessed the impact of both asynchronous and synchronous online learning and found periodontal students had high satisfaction levels with both modalities, which were elected during the COVID-19 pandemic. Nurses learning rapid sequence intubations also expressed high levels of satisfaction with the flexibility of online learning and relevance of the material being taught (Hersey & McAleer, 2017).

Synchronous Online Learning

Live online courses which encourage student-interaction and active participation are considered synchronous learning. Overall, synchronous learning activities produced the best post-test knowledge gains and highest satisfaction levels amongst students (Atack, et al., 2012; Fernandez, et al., 2016). Through online engagement with other students, discourse contributed to a self-perceived increase in learning and the sense of belonging to an educational group which increased learning engagement (Rankin, et al., 2013). Learning by Concordance is a synchronous exercise online which has an experienced clinician providing feedback to the student's responses in each clinical scenario and resulted in high self-perceived knowledge and satisfaction with the module (2016). The use of e-simulation in conjunction with an online role-playing "tabletop" exercise exhibited the strongest gains in self-efficacy when responding to a disaster scenario, and

participants described the importance of collaboration, communication, and strong leadership in responding to such a scenario (2016).

In-Situ Simulation Learning

In-situ simulation is a form of training occurring in the actual environment in which the scenario will occur (such as a procedural suite). The advantage of this form of training is that it identifies systemic technical problems and asses multidisciplinary team communication dynamics as it occurs in actual procedural environments (Villemure, et al., 2019; Rosen, et al., 2010; Patterson, et al., 2013). Valuable nontechnical skills can be taught during in-situ simulation, such as effective communication, rapid decision-making, situational awareness, and leadership (Owei, et al., 2017), while providing education in an efficient, time-effective method (Brown, et al., 2021). The use of in-situ simulation has been associated with multiple benefits, including improved confidence, rapid-decision making, increased communication and familiarity in working amongst a multidisciplinary team.

The importance of in-situ simulation in training for an anesthesia emergency is to focus on rapid assessment of needs through process thinking. The integration of Raid Cycle Deliberate Practice into in-situ simulation was successful in improving performance of learning by involving repetitive performances of an emergency scenario with ongoing feedback from a trainer or "coach" (Ericsson, 2008; Brown, et al., 2021). In this form of in-situ simulation, three conditions involving repetition and ongoing feedback must occur to expedite improvement in the learner's simulation performance. These are: (1) awareness of what actions need to be improved; (2) immediate feedback of performance; and (3) practicing tasks repeatedly (2008). Use of a "nano" or brief in-situ simulation utilizing the Rapid Cycle Deliberate Practice method was

found to increase efficiency of performing correct actions during a five-minute simulation practice and increased self-reported confidence and satisfaction with the sessions (2021).

The reality of in-situ simulations may vary depending on the fidelity of the subject being intervened upon. A high-fidelity mannequin will react similarly to how the body would react to an intervention, such as exhibiting tachycardia, respiratory distress, vital sign changes, and mimic tactile responses such as pain. Such mannequins are complex to set up, expensive and require a trained operator to control the computer programming. In contrast, a low-fidelity mannequin will not react or have the same reality but will allow the simulation participant to act upon the mannequin, like those used during cardiopulmonary resuscitation or suturing practice as examples. Live role-playing is another example of low-fidelity simulation, and in this case invasive interventions are not conducted.

Based on the evidence and fit with the project site, the use of an asynchronous video learning tool, made assessable on the internet, along with low-fidelity in-situ simulations was used to educate the perioperative anesthesia NPs. The asynchronous educational video was easily accessible and flexible for varying schedules. Members of the perioperative department were the role-playing actors in the video simulation. The online education video was of minimal cost to produce and deploy thus, being the most practical method of asynchronous learning for this group.

Rationale

Albert Bandura's Social Cognitive Theory was the driving force for the construction of this project, as this quality improvement activity served to change and reform behaviors through increased self-efficacy. Social Cognitive Theory is based on learning and augmenting behavior through interactivity with the social and organizational environment (Bandura, 1986; BU School

of Public Health, 2021). The first of the six Social Cognitive Theory constructs is *Reciprocal Determinism*, which is the theory that a behavior is impacted by the environment and a behavior can also impact the environment, thus behavior is augmented by repercussions occurring in the environment (Bandura, 1986). The second construct is *Behavioral Capability*, which is the ability to perform a behavior through knowledge and skill. This concept was central to the in-situ stage of this project as it served to provide baseline knowledge before simulation begins. *Observational Learning* is the third construct, which is the ability to learn through observing the behaviors of others in the environment. Observation using an online video and further corrective instruction during the debriefing stage of in-situ simulation served as a major factor for learning in this project. *Reinforcement* of a learned behavior is the fourth construct, which was exercised during and after the in-situ simulation to affirm correct actions and created an environment conducive to learning. The fifth construct is *Expectations,* which is the anticipated response to a behavior. It was assumed that the participants would complete the actions demonstrated in the video, and a successful evaluation was based on those desired behaviors. The final construct is *Self-Efficacy*, which is the confidence one has in performing a behavior through adequate knowledge. Simulations are associated with increased self-efficacy (O'Leary, et al., 2015), therefore this concept was central to the success of the project. The multimodal educational initiative (video and in-situ simulation) integrated the constructs included in social cognitive theory outlined above by integrating the contextual elements of the environment, provided competency-based training and embedded the training in this highly specialized environment.

The 8-Step Process for Leading Change Model (2021) developed by Dr. John Kotter, was used to guide the implementation of this project (Figure 1). This model served as a building block for organizing, developing, and implementing the online learning tool and in-situ simulation. A sense of urgency amongst perioperative anesthesia NPs was identified through small group discussions and a survey regarding topics of education which need to be addressed. A guiding coalition was identified, including education-focused clinicians and certified nurse anesthetists. The project conjured anticipation for the in-situ simulation, which reinforced learning and empowered the NPs to participate effectively in an anesthesia emergency, thus creating the sense of a "quick win." Barriers to learning were removed by providing an easy to access online video which was watched as many times as the NP required to become comfortable with the learning material. The in-situ simulation was brief, nonpunitive and structured to provide positive reinforcement, with the intention to make the sessions a social activity and enjoyable for the participants.

Figure 1.
Kotter's 8-Step Process for Leading Change Model:
1. Create a sense of urgency.
2. Form a guiding coalition.
3. Create a strategic vision.
4. Enlist a team.
5. Empower others.
6. Create quick wins.
7. Enable action by removing barriers.
8. Institute change.

Figure 2.
Ericsson's Model of Deliberate Practice

Future Talent Learning (2019)

K. Anders Ericsson's concept of *deliberate practice* (Figure 2) is based on one's motivation of acquiring a skill through repetition and refinement using feedback from a coach. Thus, increasingly repeating correct actions through practicing more independently will provide mastery of a skill (Ericsson,

2008). Hunt, et al (2014) further evolved this model to develop the Rapid Cycle Deliberate Practice methodology which utilizes short rapid-cycle simulations with immediate feedback on performance of an action to imprint memory.

Specific Aims

This quality improvement project sought to improve knowledge and subsequent self-efficacy or confidence of perioperative anesthesia NPs in responding to an anesthesia emergency using an online learning module and hosting in-situ simulation sessions. The specific aims of this project included:

- Determine priority anesthesia emergency topics as defined by the perioperative NP group, anesthesia leadership and Quality and Safety Initiative.
- Develop and implement an online asynchronous video tailored to local priority educational needs regarding anesthesia emergencies.
- Host a locally tailored in-situ simulation of an anesthesia emergency scenario with a debriefing session for feedback and correction as needed.
- Improve knowledge and self-confidence of perioperative anesthesia NPs responding to an anesthesia emergency.

Methods

Context

Implementation of this project occurred in the Department of Anesthesia, Critical Care and Pain Medicine at a large urban teaching hospital in the Boston area. Approximately 16,000 operative cases are completed in the general surgical rooms, and over 17,000 procedures are conducted in remote areas, including the departments of gastroenterology, electroconvulsive therapy, and cardiology (Annual Report, 2019). The department is growing swiftly, as surgical

and procedural cases increased in volume. The anesthesia provider is tasked with completing pre-anesthesia assessments, answering patient questions, writing orders, and preparing the procedural room for the next case, all while providing assistance with post-operative care needs. Since procedural cases in remote areas tend to be short in duration, assistance with pre and post-procedural assessments was determined to be a priority, and the role of the perioperative anesthesia NP evolved to compliment these needs. The NP performs patient assessments, places intravenous lines for anesthesia administration, writes for pre and post-anesthesia medications, and responds to post-operative pages from the nursing staff. This crucial role has allowed the anesthesia provider more time to adequately prepare the procedural room for the next case, perform a quick pre-anesthesia assessment, obtain anesthesia consents, and respond to emergent anesthesia needs if necessary.

In remote procedural areas, rare intraprocedural anesthesia emergencies occur, and the perioperative anesthesia NP is usually the first clinician to respond. These types of emergencies differ from typical Advanced Life Support (ACLS) emergencies, as the relate specifically to anesthesia or airway concerns. Such emergencies include but are not limited to bronchospasm, laryngospasm, aspiration, difficult airway intubation or airway patency, mid-procedure loss of intravenous lines for administering anesthesia medications, hypotension, bradycardia, and general adverse anesthesia reactions. The response of these scenarios requires specialized equipment and training, different from the ACLS training required for all departmental NPs. However, specific education regarding the location of emergency anesthesia equipment and proper response to such emergencies is limited, as educational focus is directed to anesthesia residents and physicians. Providing organized educational material directed at clinicians without formal anesthesia training was the driving force to designing this quality improvement initiative.

Low levels of confidence in responding to anesthesia emergencies is attributed to the lack of education directed to the perioperative anesthesia NPs. The construct of confidence is defined as the ability to utilize knowledge to perform a behavior or action. Therefore, knowledge serves as the basis for attainment of confidence, which reduces anxiety when responding to a potentially stressful scenario (Center, et al., 2013). According to the American Psychology Association, encompassing a high degree of self-efficacy reflects one's perceived level of confidence in responding to a situation (APA, 2022), and Albert Bandura's Social Cognitive Theory depicts confidence as a capability learned from a supportive educational environment. Therefore, providing education to create knowledge using an online module and enforcing the education by performing in a real-environment scenario will increase self-efficacy in responding to an anesthesia emergency.

Educational Intervention

The educational intervention developed for this quality improvement project focused on implementing an asynchronous online video and an in-situ simulation. Prior to designing the educational module, the perioperative NPs were provided a list of potential topics related to anesthesia emergencies to determine additional material to be addressed in the educational module. The NP project lead then assembled an educational focus team consisting of anesthesia educators and certified nurse anesthetists to help the NP project lead in formulating the material addressed in the video. A storyboard (see Appendix C) was designed to visualize the information attained from the NPs and educational focus team for the content and design of the educational video. The educational focus team assisted in formulating the emergency simulation depicted at the conclusion of the educational video, which served as basis for the in-situ simulation scenario.

A flow guide (see Appendix D) describing the correct actions during the in-situ simulation was developed at this time.

The NP project lead wrote the script to accompany the video component of the educational module, which was reviewed by members of the educational focus team. The video was recorded according to the outline defined by the storyboard and was edited by the NP project lead prior to posting on the internet. The video was published to the internet for NP viewing and will remain on the internet indefinitely for review as needed. A link to the video was provided to the NPs through both hospital email and personal texts, allowing for easy viewing capabilities on either computer or mobile devices. The NPs were instructed to view the video as many times as needed prior to the scheduled in-situ times. Scheduling for the in-situ simulation was secured with agreement of the procedural staff. The in-situ simulation sessions were staffed with the assistance of procedural staff and the educational focus team. The simulations followed a scripted scenario as defined by the flow guide, and observational logs were maintained during the simulation sessions and debriefing. The use of Rapid Cycle Deliberate Practice, a simulation strategy that focuses on rapid acquisition of skills, was utilized during the debriefing process as needed. This strategy was developed to repeat, practice and/or correct actions to promote mastery of emergency skills.

Evaluation of the Educational Intervention

The Plan-Do-Study-Act (PDSA) model assisted in organizing and evaluating this quality improvement initiative. During the “plan” stage, the NP project lead organized and managed an educational support focus team which served to determine what topics and material needed to be addressed for the educational element, and identified the resources required to create the online module and in-situ simulation. The “do” phase consisted of the development and deployment of

the online video, along with the creation and implementation of a locally tailored interdisciplinary in-situ simulation of an anesthesia emergency. The "study" phase was the analysis of the project through observations and surveys to determine if the project was successful. It will also be a time to assess areas for future improvement. The "act" phase was the incorporation of the recommendations or changes for future simulations, or consideration of a larger-scale overhaul of the project, if warranted.

Measures and Analysis

Measures that demonstrate how attainment of the specific aims was achieved is organized according to the project objectives.

Objective #1. *Determine priority anesthesia-specific emergency topics as defined by the perioperative anesthesia NP group, anesthesia leadership and the Quality and Safety Initiative*. Attainment of this objective was operationalized as the identification of priority anesthesia-specific emergency topics by the perioperative anesthesia NP group. A survey (see Appendix E) was used to gather this information. The survey consisted of four educational topics predetermined by the Quality and Safety Initiative and anesthesia leadership, and the NPs were able to choose multiple topics if desired. An open-ended question also offered an area to place suggestions for other topics not addressed or general input. Frequency of responses to each priority area were used to the describe the outcome for this objective.

Objective #2. *Develop and implement an online asynchronous video tailored to local priority educational needs regarding anesthesia emergencies.* The most relevant educational needs were determined by the proportion of responses from the NP educational survey. The project NP lead assembled an educational focus team consisting of anesthesia educators and nurse anesthetists to assist with the development of a storyboard and flow guide for the video

material and scenarios to be depicted in the video. The online asynchronous video was posted to YouTube (Figure 3), and a post-educational survey collected information on the number of times the video was watched, along with the number of participants who watched the video.

Figure 3. **YouTube Links**
Educational Video (Full Length)
https://studio.youtube.com/video/GO3iEv58QN0/edit#:~:text=Video%20link,youtu.be/GO3iEv58QN0

Simulation Scenario Video
https://studio.youtube.com/video/ndGFEN9JmEI/edit#:~:text=Video%20link,youtu.be/ndGFEN9JmEI

Objective #3. *Host a locally tailored in-situ simulation of an anesthesia emergency scenario with a debriefing session for feedback and correction as needed.* Reactions, questions, and comments during and after the simulation were recorded using a simulation observation log (see Appendix F). The log also recorded observed levels of confidence while performing desired actions according to the flow guide. After the in-situ simulation sessions were completed, a post-educational survey was distributed to determine the effectiveness of the educational module through self-reflection of improved knowledge and confidence.

Objective #4. *Improve knowledge and self-confidence of perioperative anesthesia NPs in responding to an anesthesia emergency.* A nine-question post-implementation survey developed by the NP project lead (see Appendix G) was distributed after the conclusion of the in-situ simulation and served to determine the effectiveness of the educational module. The anonymous survey was distributed online through AllCounted.com survey software and consisted of 5 Likert-style questions (1= strongly disagree to 5=strongly agree), two nominal questions to determine the number of times one watched the video, and time between watching the video and performing the simulation, one ordinal question for time employed in the department, and an open-ended question for participant commentary. Follow-up reminders for completion of the survey was sent to the NPs who completed the entire educational module of watching the video

and performing the in-situ simulation session with a goal to obtain 100% participant feedback Aggregated scores were calculated to describe this outcome.

Ethical Considerations

This project was developed as a quality improvement incentive and was not used for research purposes. The project followed techniques used in quality improvement projects, such as the PDSA cycle. The project hospital determined that the project is quality improvement and did not need to be reviewed by the hospital IRB prior to implementation.

The University of Massachusetts Boston Clinical Quality Improvement Checklist was completed and demonstrates that the project satisfies the requirements for quality improvement (Appendix H). The project or innovation proposed is quality improvement and not meet the definition of human subjects research because it is not designed to generate generalizable findings but rather to provide immediate and continuous improvement feedback in the local setting in which the project is carried out. The University of Massachusetts Boston IRB has determined that quality improvement projects do not need to be reviewed by the IRB.

Results

The Anesthesia Quality and Safety Committee along with anesthesia leadership recommended that the primary educational topic to be addressed in the educational module was to increase efficacy in responding to anesthesia emergencies. Specific topics identified as potential learning needs were identification and location of anesthesia emergency equipment, assisting during an anesthesia emergency, review of ACLS protocols, and drugs used during anesthesia emergencies.

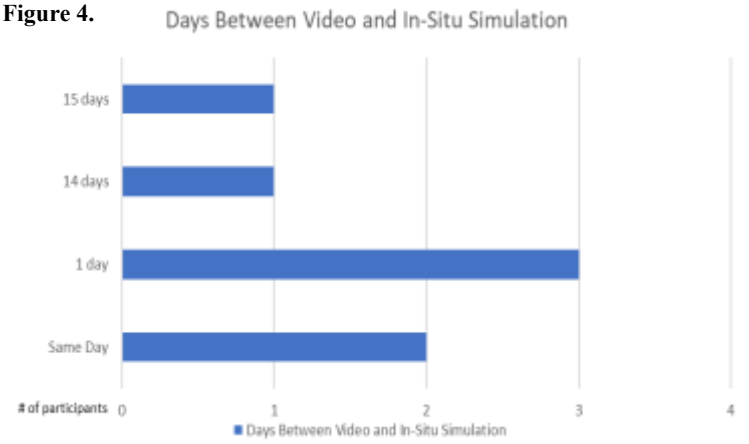
There are a total of eleven perioperative anesthesia NPs in the Department of Anesthesia. Of this group, 73% (n=8) completed the initial learning topic survey. The most common priority

need for education among this group was the use of drugs during an anesthesia emergency, with a total of 88% (n=7). Identification and location of equipment and assisting during an anesthesia emergency were equally agreed upon as topics for educational need, as 63% (n=5) listed these topics in the survey. The open-ended question regarding other topics of interest or general input regarding educational topics yielded five additional comments. One participant identified the need for increased education regarding emergency response "specifically in the GI units," while two others agreed "assisting the anesthesia provider" was a priority, which aligned with the aims of this project. One participant remarked on the importance of learning "the anesthesia carts in the room like we learned code carts as a nurse," and another participant responded the "chain of command or communicating with the code team" as an important topic. Two participants also mentioned the importance of knowing ACLS protocol, even in an anesthesia emergency.

The educational focus team consisted of one anesthesiologist and seven nurse anesthetists, with the purpose of providing guidance and validity of the educational material provided in the video and reality of the simulation. During the formulation of the educational material to be covered in the video and simulation, it was decided that one anesthesia emergency scenario should be identified as the most relevant emergency. The educational focus team brainstormed several typical anesthesia emergencies occurring in remote areas, and all team members agreed laryngospasm is the most common anesthesia emergency scenario occurring in remote areas such as gastroenterology.

At the initiation of this project, there were nine perioperative anesthesia NPs who watched the educational video and of this group, 89% (n=8) participated in the in-situ simulation and completed the post-educational survey. Observational logs captured real-time reactions to the in-situ simulation such as intra-simulation questions or hesitancy, appearance of confidence, and timeliness in performing desired actions. Days between watching the video and performing the in-situ simulation were variable with a mean of 6.5 days. Two of the participants watched the video approximately two weeks prior to the simulation, and one of these participants experienced difficulty in recalling the actions desired to break a laryngospasm. The number of times the video was watched was once or twice, with a mean of 1.38 (Figure 4).

Figure 4.

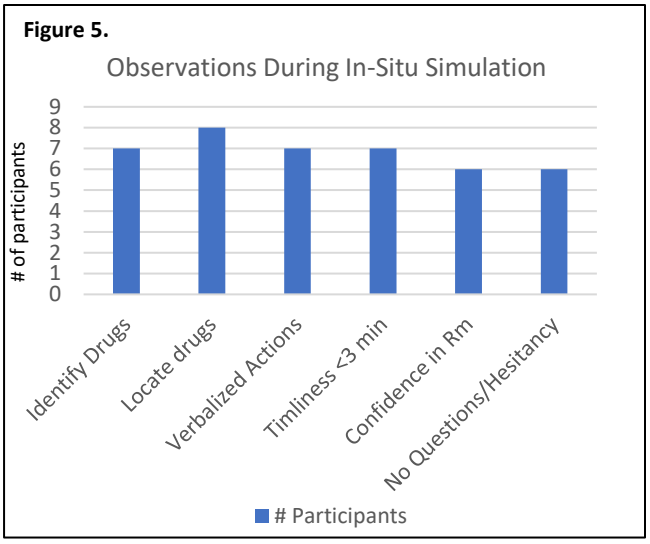


Demographics were limited in this project to maintain anonymity. Sixty-three percent (n=5) have been employed in the anesthesia department for 0-2 years, 13% (n=1) have been employed for 3-5 years, and 25% (n=2) have been employed over six years.

The in-situ simulations took place over the course of 5 weeks between February and March 2022. The sessions were held in one commonly used gastroenterology procedural room with a Drager Fabius Trio anesthesia machine and OmniCell medication dispensing machine. This room was used for in-situ simulations due to its typical procedural room layout, arrangement of machines and staff availability to assist with in-situ simulations.

Overall, participants in the simulation performed well. As illustrated in Figure 5, of the eight participants, 88% (n=7) were able to verbalize their actions while participating in the in-situ simulation, such as turn up the oxygen, locate the adjustable pressure-limiting (APL) valve, turn it up to 30%, push the oxygen flush valve to fill the oxygen bag, and squeeze the pressurized oxygen bag to break the laryngospasm by creating positive pressure in the airway. One participant did not complete the in-situ simulation. This individual stated that they felt uncomfortable with participating in the scenario because they watched the video too far in advance (approximately 2 weeks) prior to performing the in-situ simulation. Although the simulation was aborted, the Rapid Cycle Deliberative Practice method was initiated during the debriefing session to provide hands-on intra-simulation practice of the above actions. The participant rewatched the video independently after the simulation and participated in the second week of simulations with 100% improvement in accuracy in completing flow guide actions.

Figure 5.



Participant #8 in the observational log was hesitant to manipulate the anesthesia machine but was able to complete the actions according to the flow guide appropriately. In the debriefing session, the use of Rapid Cycle Deliberate Practice was utilized again to increase comfort and confidence in using the anesthesia machine. After practicing the sequence of actions on the machine, confidence was increased by stating that the activity was "…*incredibly helpful because I was never taught this in training. Reading about the process of breaking a laryngospasm would*

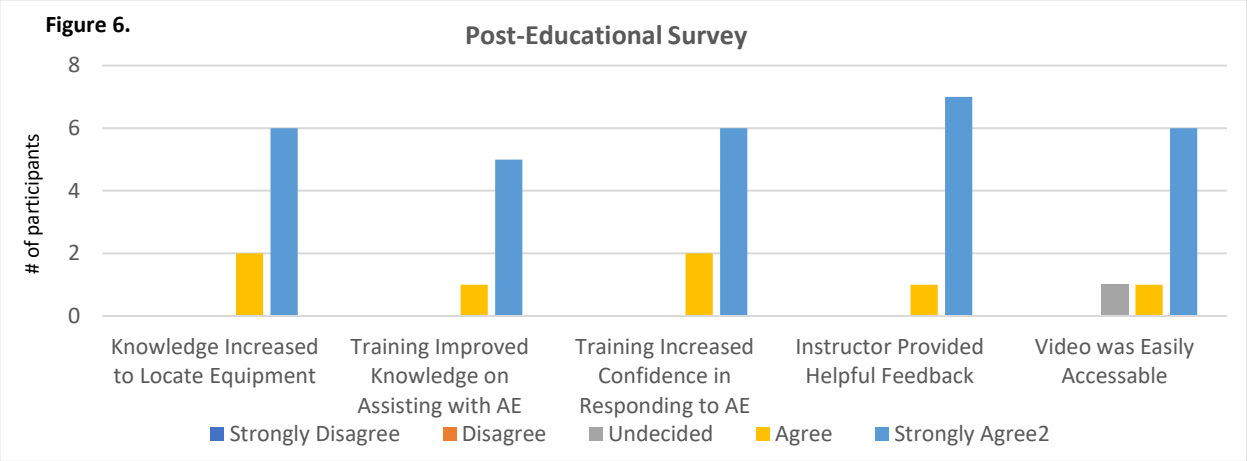
not be helpful. Actually seeing and doing the actions makes me feel more ready for something like this in real-life."

According to the in-situ observation log, 88% (n=7) of the participants were able to complete the actions according to the flow guide within three minutes, and 75% (n=6) of the participants exhibited subjective confidence in performing the actions, and the same amount did not exhibit hesitancy or ask intra-simulation questions. During the debriefing process, participant #2 appreciated the short duration of the video simulation, as it was reviewed a few hours prior to the in-situ simulation and was attributed to performing the in-situ simulation successfully. Participant #5 stated increased confidence in performing the in-situ simulation after a real-time airway emergency occurred in the same procedural room earlier in the week, and the simulation in the video helped gain knowledge on appropriately responding to the emergency. Participant #7 remarked on feeling more confident after watching the video in the same day as the simulation and would like to participate in other similar simulations in the future.

Post-educational surveys were available online through AllCounted.com during the month of March. Those who completed the entire educational module consisting of watching the video and completing the in-situ simulation session completed the survey (n=8). This high response rate (100%) provides robust feedback around the educational initiative. The results were positive, as all participants agreed the educational module increased knowledge on locating anesthesia emergency equipment. All participants agreed the training improved knowledge on assisting during a laryngospasm, with 12% (n=1) agreeing and 88% (n=7) strongly agreeing to this statement. Confidence was unanimously increased as 25% (n=2) agreed and 75% (n=6) strongly agreed the educational module was effective (Figure 6).

The NP project lead was the instructor during the in-situ simulation sessions. Thirteen percent (n=1) agreed and 88% (n=7) strongly agreed the instructor provided helpful feedback during the in-situ simulation and debriefing sessions. Most participants agreed the video was

Figure 6.



easily accessible as 75% (n=6) strongly agreed, 13% (n=1) agreed, and 13% (n=1) was neutral on this statement.

The last question on the post-educational survey was to describe perceived barriers to learning in the Department of Anesthesia. Four participants replied, two mentioned a lack of time available for education. One participant stated that availability of NP-specific educational topics was limited, such as training for ultrasound-guided IV placements and arterial line placements. One participant stated a hesitation to touch anesthesia equipment as a limitation to learning, which was also mentioned during an in-situ debriefing session

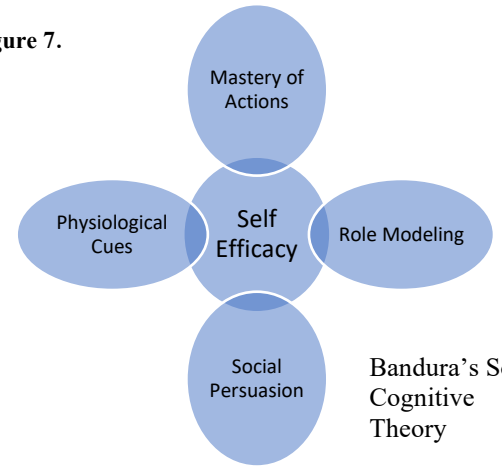
Discussion

Summary

The overarching aim of this quality improvement project was to increase perioperative anesthesia NP knowledge and confidence in responding to an anesthesia emergency. This aim was met by producing what can be considered a “Just-in-Time” video and complementary in-situ simulation to reinforce the learning. Prior to completing a task or activity, a “Just-in-Time” video

has been associated with a reduction in time to perform an activity and improves performance (Davis, et al., 2012; Lee, et al., 2016). This was evident as most participants in this project were able to complete the in-situ simulation task of increasing airway pressure to break a laryngospasm in under three minutes. The multimodal video in this project visualized equipment though online demonstrations and an intra-video simulation increased learner engagement, improved knowledge, and self-efficacy, as Hersey and McAleer (2017) also discovered in their study. It was encouraging to note that both self-report and direct observation of participants demonstrated improved confidence in responding to an anesthesia emergency, specifically laryngospasm. There is ample evidence in the literature that just-in-time education in tandem with in-situ simulation produces positive outcomes and it was encouraging to see that happen in this project.

Figure 7.



Bandura's Social Cognitive Theory

The use of Social Cognitive Theory (Figure 7) in the construction of this multimodal educational initiative was helpful because it situated self-efficacy as a central tenant in the project. The use of vicarious learning or role modeling through watching a video and performing learned actions among colleagues leads to the sense of efficacy in responding to an anesthesia emergency. Social persuasion to correct or reinforce actions in a positive learning environment with the use of the Rapid Cycle Deliberative Practice method helped to create a physiological sense of achievement and confidence. Possessing a mastery of the learned actions empowers the NP to be an active participant in the anesthesia team, which aligns with one of the foundational pillars of anesthesia

department excellence, developed by the Anesthesia Quality and Safety Initiative. One goal of this strategic plan is to incorporate nurse anesthetists and nurse practitioners into the culture of education and safety through increasing access to education (Just Breathe, 2019), and this initiative provided education tailored specifically to the perioperative anesthesia NPs.

Not all participants in this project expected a positive educational experience during the in-situ simulations. In the simulation observation log, participant #1 appeared to have anxiety entering the simulation portion of the project, expressing concern for a "pass" or "fail" component. The in-situ simulation was aborted to assure a positive learning environment by rescheduling the simulation to another week, allowing for reviewing of the video, as it was watched two weeks prior to the in-situ simulation session. This reaction aligns with the literature which suggests watching the educational video close to the simulation time improves confidence in performing an activity (Lee et al., 2016). Hands-on practice with the anesthesia machine using Rapid Cycle Deliberate Practice was also offered, and this participant successfully completed the in-situ simulation with apparent ease during the rescheduled in-situ simulation session. Similarly, participant #8 completed the in-situ simulation according to the correct actions in the flow guide, but requested to repeat the activity, thus Rapid Cycle Deliberate Practice was used in this scenario and effectively increased comfort in using the anesthesia machine.

The initial survey detailing priority educational topics among the perioperative anesthesia NPs was informative, but material to be covered in this educational initiative was primarily determined by the Anesthesia Quality and Safety Initiative. Drugs used during anesthesia emergencies was integrated into the video, but other topics were not due to limitation in video and in-situ simulation time. Additional educational material would distract from the "Just-In-

Time" video focus and in-situ simulation, which incorporated Rapid Cycle Deliberative Practice to master fast-paced skills to break a laryngospasm.

However, similar educational modules could address these topics in another format. Open-ended comments in the survey among the NPs suggested increased education regarding emergency response "specifically in the GI units" could lead to another video and in-situ simulation regarding assisting during an aspiration event, which was identified as the second most common anesthesia emergency among the educational focus group. Other topics for education included ultrasound-guided intravenous or arterial line insertion, which may be easily addressed in a brief educational video, with the use of mannequins for simulation.

The importance of learning how to effectively communicate with the team during an emergency was identified as a learning priority in the NP survey. The literature emphasizes in-situ simulation as an invaluable tool for learning how to communicate effectively in a multidisciplinary team dynamic, and another in-situ simulation incorporating a more diverse multidisciplinary team, such as in an ACLS review, would be a beneficial future learning opportunity. Recommendations from the participants after the conclusion of the project were to include other first-assist or procedural NPs from diverse surgical specialties to learn about assisting during an anesthesia emergency. Executing the in-situ simulations for these scenarios would require cooperation of multiple teams with a larger educational leadership team to develop the educational video and in-situ simulation.

This educational initiative was developed and conducted during the COVID-19 epidemic, and availability of non-clinical staff in the hospital during the filming and editing process was extremely limited. Access to videographers and experienced video editors was limited. The original videographer scheduled to film the simulation for the video was unable to return to the

hospital due to lingering quarantine restrictions, and the video was subsequently filmed on a Samsung Galaxy S21 Ultra cellular phone by a procedural nurse and a nurse anesthetist. The video was also edited using a software developed for mobile devices, and the NP project lead was responsible for the entirety of these processes, which required extra time to complete.

The Anesthesia Quality and Safety Initiative envisioned more short educational videos to be maintained on the anesthesia intranet using a private Vimeo account. However, the video in this module will remain as an open-access educational resource on YouTube, as this was considered a pilot project. Follow up educational videos will incorporate professional editing and dedicated videographers and remain as enduring material on the anesthesia intranet.

Conclusions

Implementation of a brief "Just-In-Time" video and a locally tailored in-situ anesthesia emergency simulation was effective in increasing perioperative anesthesia NPs confidence in reacting to laryngospasm, a common anesthesia emergency. Numerous factors contributed to low levels of confidence among perioperative anesthesia NPs in responding to anesthesia emergencies. Primary concerns included inadequate educational resources, poor inclusivity of the NPs in the culture of education in the anesthesia department, and limited time allotted for education during work hours. The use of a short, easily accessible educational video and brief in-situ simulation was a successful response to these issues by increasing flexibility in education, inclusivity of the NP as a knowledgeable member of the anesthesia team and possessing the ability to assist in an anesthesia emergency, thereby encouraging further education for the NPs.

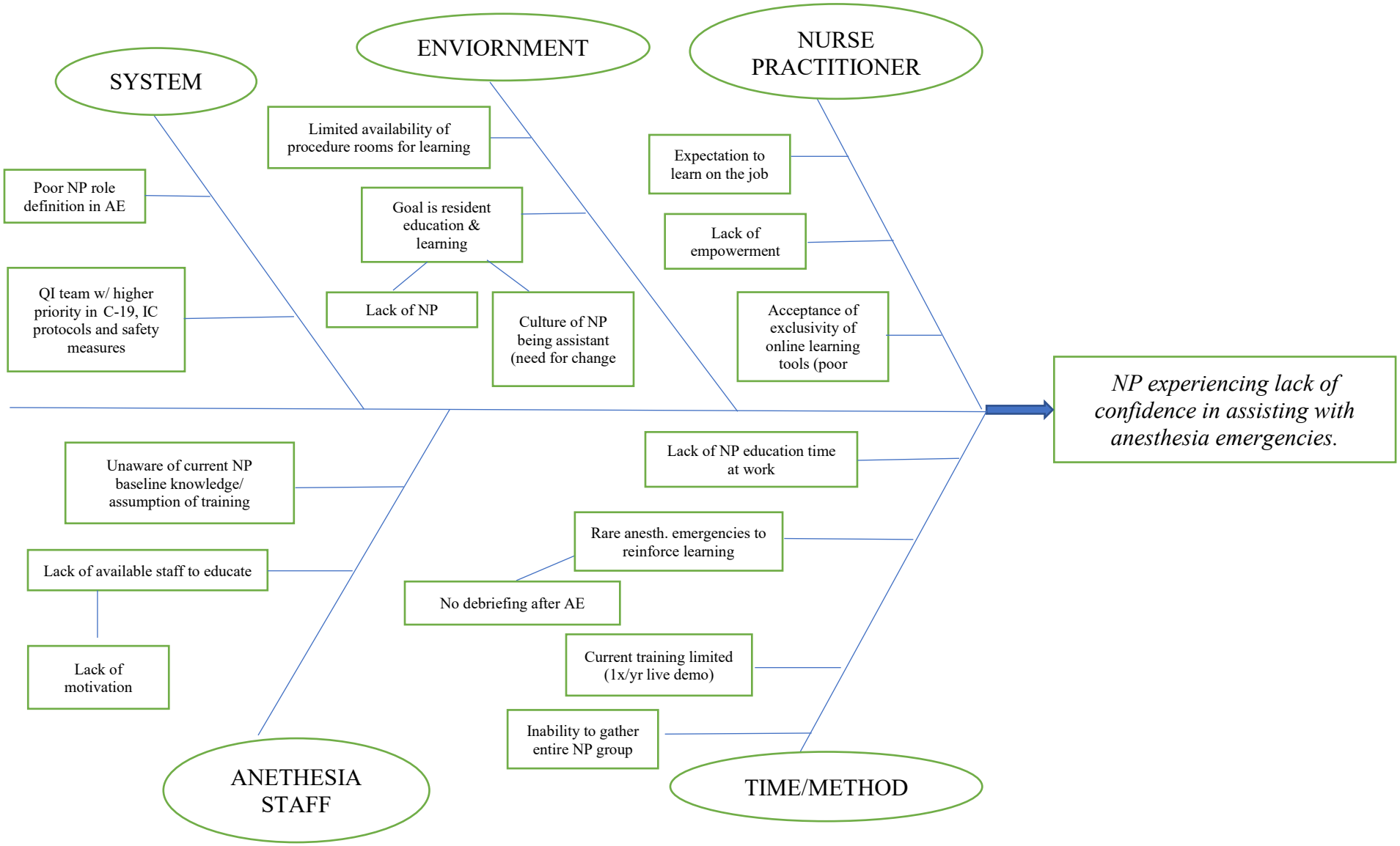
Future recommendations for producing more educational videos would be to utilize the anesthesia communications and information technology departments to efficiently produce more professional appearing videos. Incorporating multidisciplinary teams for future in-situ

simulations will require further involvement of the Quality and Safety Initiative, educational focus team and anesthesia leadership. This can be achieved through a higher level of organization from the NP project lead, which was recognized through the evolution of this educational initiative.

This quality improvement initiative was successful by increasing perioperative anesthesia NP self-efficacy in responding to an anesthesia emergency. Participation in this educational module was voluntary. The goal of this initiative was to increase education for all perioperative anesthesia NPs, and therefore future educational modules will be mandatory as a professional competency requirement.

Appendix A

Cause and Effect Diagram (Fishbone)



Appendix B

Table 1: Synthesis Table

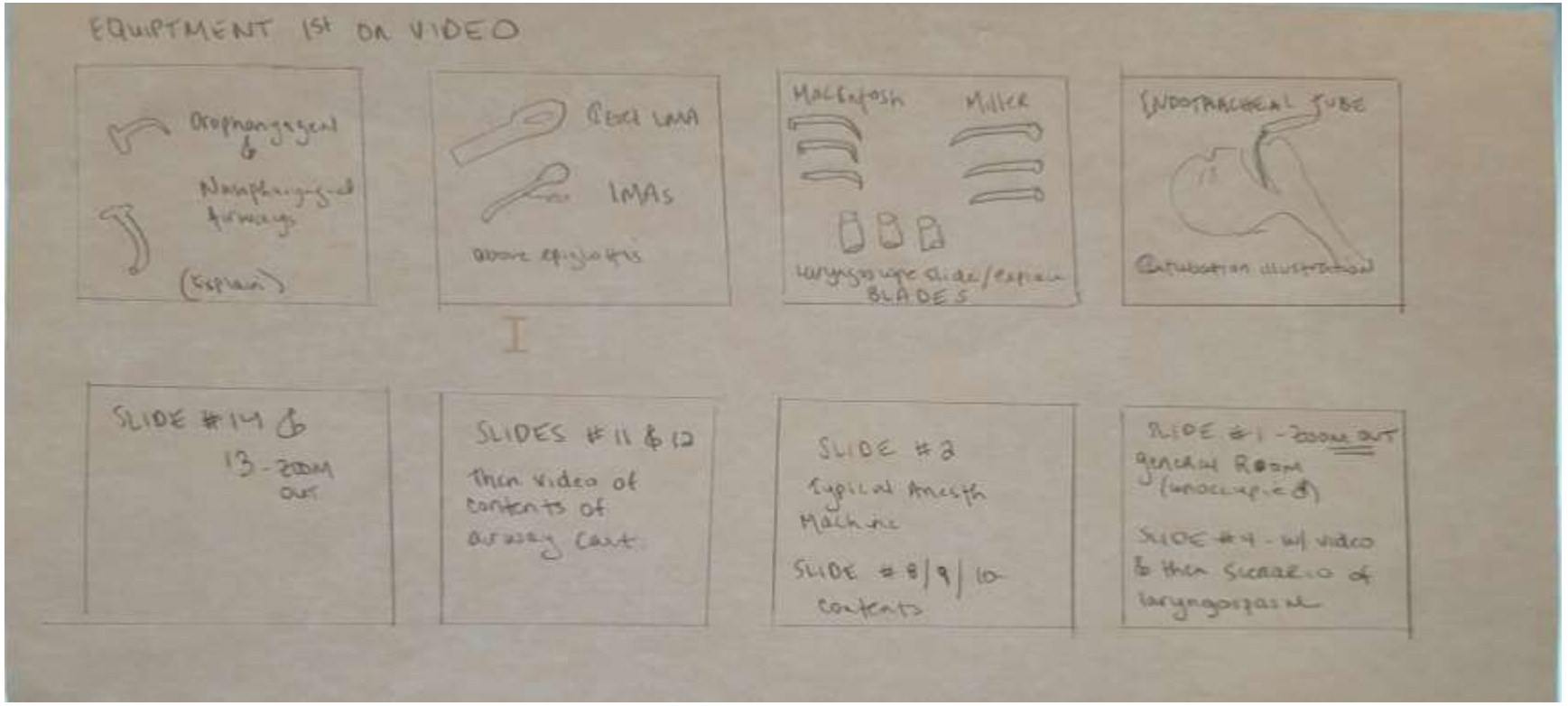
Intervention	Studies	Significant Outcome	Level of Strength/Sample
Online Learning/e-learning modules/simple videos a) Noninteractive vs. interactive e-learning	a) Leszyznski, et al. (2015)	a) Most improved post-intervention testing scores among group with interactive e-learning (interactive videos forcing students to answer automatically-generated questions mid-video	a) I, B 94 students in paramedicine (n=72) and nursing (n=34)
b) Use of mistake-referenced video vs. textbook/normal PE video	b) Zhang, N., & Chawla, S. (2012)	b) Both types of videos increased posttest knowledge of PE exam; mistake-ridden video group with highest posttest PE exam scores.	b) II, B 191 Chiropractic students randomly assigned into 3 cohorts
c) Use of online learning module to teach protocols of HEART Pathway across different medical specialties (simple online learning with minimal graphics)	c) Hartman, N.D., et al. (2016)	c) Although post-test scores of HEART improved across all specialties, highest increase in internal med., & hospitalists (non-emergency specialists). Multidisciplinary finding: all benefitted from simple online module.	c) III, B 486 enrolled Internal med =42% Emerg. Medicine=14.5%
d) Open-access e-learning video, no interactive components. Demonstrations.	d)Hersey, P., & McAleer, S. (2017)	d) Increased self-perceived confidence in ED nurses role as airway assist in RSI w/e-learning module.	d) III, B n=24 (nurses in ED w/o formal RSI training)
e) Use of social media w/ free open access educational podcasts.	e) Andrejco, K., et al. (2017).	e) The use of podcasting has enhanced traditional education.	e) 7 articles; qualitative and quantitative V, B
f) Effect of asynchronous learning video on education on CKD and satisfaction rates with asynchronous learning	f) Sinclair, et al. (2019)	f) Poor pretest knowledge resulted in lower post-viewing test scores, poor support for simple video to learn new/novel material. High satisfaction scores.	f) 220 renal nurses at various levels of practice and experience. II, B

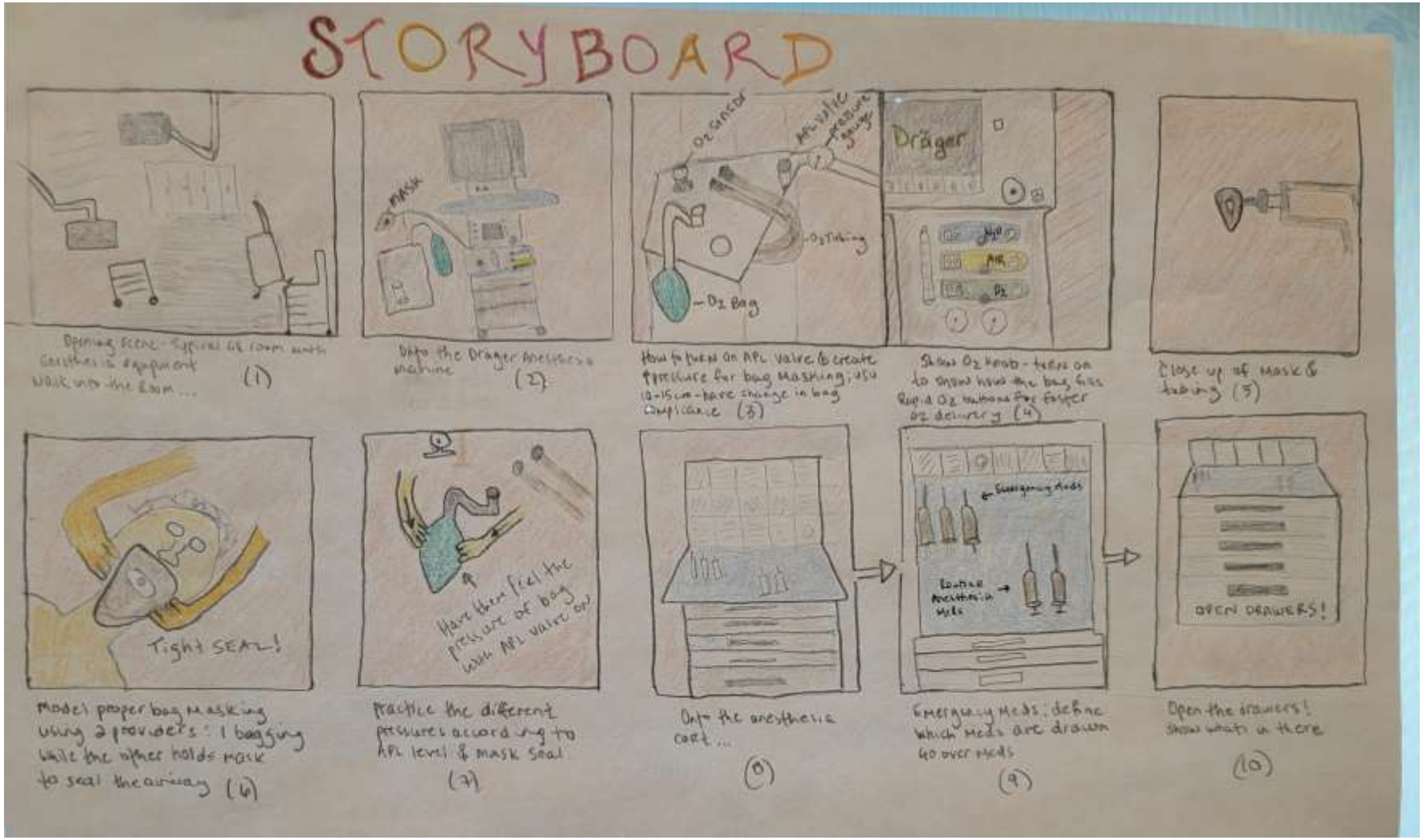
Web-based learning w/ online discussion a) Implementation of online triage skills course w/ online discussions vs. control b) Implementation of online cognitive apprenticeship "learning by concordance" (LbC) online program w/ expert explanations of correct answers by experts	a) Rankin, J.A., et al. (2013) b) Fernandez, N., et al. (2016)	a) RN triage acuity increased, suspected increased patient safety. b) LbC effective to acquire contextualized knowledge to support transition from theoretical courses to clinical practice.	a) II, B 132 RNs, emergency room b) II, B Sample of students analyzed = 304
Online Learning w/post learning simulation / evaluation a) Online learning followed by tabletop exercise b) Use of patient safety vignettes vs traditional lecture c) Use mobile-based video vs. control group d) Use of mobile-based animation video on chest tube insertion (JITL) e) "Just In Time Training" (JITT) mobile device video on volar splinting	a) Atack, L. et al. (2012) b) McLain, N.E., et al. (2012) c) Lee, N., et al. (2016) d) Davis, J.S., et al. (2012) e) Wang, V., et al. (2015)	a) Increase in post course competency scores w/ basic online course; best post course scores w/ addition of tabletop exercise. Overall high satisfaction rates with module. b) PSV increases meaning in learning than regular written case scenarios. c) Video clips on mobile devices increased self-perceived confidence scores in ability to perform urinary catheterization. d) Improved chest tube insertion after utilizing mobile device r/t increased flexibility and immediate preprocedural learning. e) Exhibited improved volar splinting test evaluations w/ use of video viewing preproced.	a) III, A n=72 sample size; most RNs, only 2 MDs b) II, C n=24 SNRAs in 2 study arms. c) I, B n=72 nursing students d) II, B n=128 e) II, B n=29 enrolled: Control grp n=14 JITT grp n=15

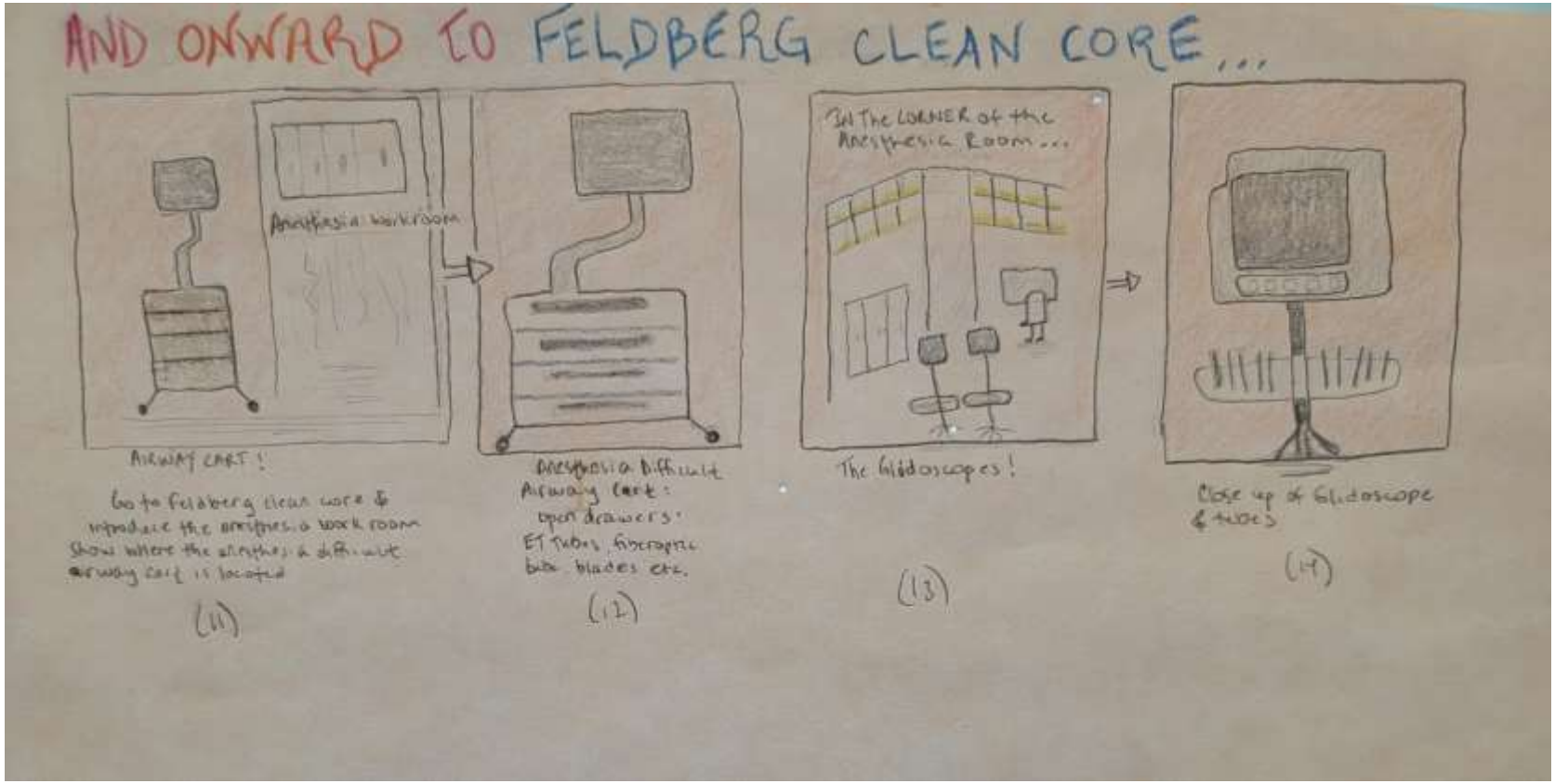
f) Supplementation of live virtual learning with online video viewing	Garcia,, et al., (2020).	f) Combination of virtual synchronous and asynchronous learning beneficial (COVID-19 online learning) with high satisfaction levels.	f) 48 senior dental students; informal study with qualitative reflection

Appendix C

Storyboard




STORYBOARD
Dräger
Tight SEAL!
Have them feel the pressure of bag with APL valve on
OPEN DRAWERS!


AND ONWARD TO FELDBERG CLEAN CORE...
Anesthesia workroom
AIRWAY CART!
Go to Feldberg clean core & introduce the anesthesia work room show where the anesthesia difficult airway cart is located
(11)
Anesthesia difficult Airway Cart: open drawers: ET tubes, fiberoptic blade blades etc.
(12)
IN THE CORNER of the Anesthesia Room...
The Glidoscopes!
(13)
Close up of Glidoscope & tubes
(14)

Appendix D

FLOW GUIDE:

Pre-briefing at doorway of procedural room: “Please verbalize what actions you are performing in assisting during this anesthesia emergency.”

Anesthesia Provider at head of stretcher: “I need some assistance in here!” (To the participant at doorway) “It looks like the patient is laryngospasming. Can you come here and help break this laryngospasm?” Anesthesia provider remains at patient’s head, holding airway mask with two hands.

Participant Goals of Action (in order):

1. Locate the oxygen gauge and turn up to max.
2. Locate APL valve and verbalize the amount of pressure the participant is turning the valve to.
3. Oxygen flush valve to fill the oxygen bag.
4. Put consistent pressure on oxygen bag.
5. Turn up the APL valve as requested. (Actions 1-5 to be completed in 3 minutes).
6. Locate the emergency medications as requested on top of the OmniCell and in the top drawer.

Total of 5 minutes to complete the in-situ simulation.

Appendix E

Educational Topics Identified by the Perioperative Nurse Practitioners

Hello All,

As many of you are aware, I am currently enrolled in UMass Boston's Doctor of Nursing Practice (DNP) Program. As part of the fulfillment of the program, I am initiating a QI project formulating an educational module to improve our response to anesthesia emergencies.

What would be the most beneficial educational material you need regarding anesthesia emergencies? Choose all that apply.

A) Identification and location of anesthesia equipment.
B) Assisting the anesthesia provider during an emergency.
C) ACLS protocol.
D) Drugs used during anesthesia emergencies.

Also, feel free to add other topics for education or comments here.

Thanks,
Sara Durgerian

Appendix F

2/18/22 (Friday afternoon)
SIMULATION OBSERVER LOG (participant #1)

Action	Observation
Situational Awareness Focus: Knowledge and Understanding, Sharing Information A. Was he/she able to identify emergency drugs and what they were used for? **(Yes)** B. Able to grab the drugs quickly in emergency scenario? **(Yes)** C. Did they understand how to respond to the laryngospasm scenario? (Explaining what they were doing during the simulation) **(No**)	Fair. • Was knowledgeable with medication drawer and what was drawn up for emergency medications. (Requested more time to review meds at end of sim). • Identified where emergency medication syringes were located on the tabletop. • Unable to explain the first few actions needed to respond to situation. Communicated discomfort with the simulation, watched the video 2 wk prior and the scenario is rare.
Decision Making Focus: Timeliness in Response Were the desired actions provided in a timely manner <3 min? **(No)**	Unable to provide actions in timely manner. Required prompting for next actions.
Confidence Focus: Comfort Level and Confidence in the Room A. Did the NP appear comfortable in the procedural room? **(No)** B. Were there questions or concerns intra-simulation (hesitation)? **(Yes)**	A. Did not appear comfortable in the room. B. Fair comfort with the scenario. C. Needed prompting and asked questions regarding what the next action was needed. D. Understood the circuit pressure concept. Needed more information as to the reasoning why increased pressure broke the laryngospasm.
Additional Observations What went well, what did not go well?	• Participant stated the need to watch the video sooner than 1 week. Preferred to watch the video immediately prior to the simulation. Will repeat simulation after rewatching the video during next week's simulation session. • Concern for "pass" or "fail" component of simulation. Needed assurance there would be no judgement if unable to complete desired tasks. • Performed a RCDP strategy at the end. NP lead repeated the correct succession of actions and had participant repeat the same actions twice. Participant requested to participate in the in-situ simulation next week.
Debriefing Questions and Discussion Explain the concept for breaking a laryngospasm.	• Agreed to repeat the simulation after the video was rewatched (remediation).

	• Discussed the holding of the pressure oxygen bag to increase positive pressure (CPAP). Practiced bag pressure while APL valve on high pressure.

SIMULATION OBSERVER LOG (participant #2) 2/18/22

Action	Observation
Situational Awareness Focus: Knowledge and Understanding, Sharing Information A. Was he/she able to identify emergency drugs and what they were used for? **(Yes)** B. Able to grab the drugs quickly in emergency scenario? (**Yes)** C. Did they understand how to respond to the laryngospasm scenario? (Explaining what they were doing during the simulation) **(Yes)**	Good. Verbalized actions upon doing them appropriately with closed loop communication. • Identified proper location of drugs. Able to quickly retrieve the drugs when requested. • Needed minimal prompting to complete goal actions (went to APL valve first instead of turning up O2 valve). • Able to verbalize actions and pressure system concept.
Decision Making Focus: Timeliness in Response Were the desired actions provided in a timely manner? (<3 min) **(Yes)**	• Actions provided in timely manner. Very little hesitation in action. • Understood the circuit pressure concept.
Confidence Focus: Comfort Level and Confidence in the Room A. Did the NP appear comfortable in the procedural room? **(Yes)** B. Were there questions or concerns (hesitation) with using the machine? **(No)**	High comfort level. • Appeared to have high level of confidence in room. • Asked to look at the emergency medication drawer for a little longer to study the OmniCell. No stagnation issue.
Additional Observations (What went well/did not go well/needs improvement	Did well with all actions.
Debriefing Questions and Discussion	• Asked to return to the top OmniCell drawer to take another look at the location of the emergency medications. • Positive reinforcement given from project lead NP. • Able to verbalize the reasoning for actions. No remediation needed. • Stated helpfulness of watching video a few hours prior to in-situ simulation. • Need to get the simulation easier to tap on. • Keep video simulation short for quick reference.

SIMULATION OBSERVER LOG (participant #3) 2/18/22

Action		Observation
Situational Awareness		Very aware of room, very familiar with procedural room.

Focus: Knowledge and Understanding, Sharing Information A. Was he/she able to identify emergency drugs and what they were used for? **(Yes)** B. Able to grab the drugs quickly in emergency scenario? **(Yes)** C. Did they understand how to respond to the laryngospasm scenario? (Explaining what they were doing during the simulation) **(Yes)**		• Able to identify emergency drugs very quickly. No hesitation. • Was able to verbalize all actions immediately and why. • Was educating me.
Decision Making Focus: Timeliness in Response Were the desired actions provided in a timely manner? (<3 min) **(Yes)**		Timely, no hesitation.
Confidence Focus: Comfort Level and Confidence in the Room A. Did the NP appear comfortable in the procedural room? **(Yes)** B. Were there questions or concerns (hesitation) with using the machine? **(No)**		High comfort all aspects. No hesitation in actions. Could be educator in this topic.
Additional Observations What went well/what needed improvement?		Approved of the educational video and material. Stated in-situ simulation is very helpful for the newer NPs to gain confidence when entering the room.
Debriefing Questions and Discussion		Discussed alternative ways to break laryngospasm without the use of the vent system: ambu bagging with disconnecting the oxygen fill bag and mask in scenario of machine malfunction.

SIMULATION OBSERVER LOG (participant #1) repeated sim 5 days after first attempt GI3

Action	Observation
Situational Awareness Focus: Knowledge and Understanding, Sharing Information A. Was he/she able to identify emergency drugs and what they were used for? **(Yes)** B. Able to grab the drugs quickly in emergency scenario? **(Yes)** C. Did they understand how to respond to the laryngospasm scenario? (Explaining what they were doing during the simulation) (**Yes**)	Much improved: Good • Identified drugs when asked. • Able to grab emergency drugs on top of OmniCell. • Good understanding of scenario. Able to verbalize actions while conducting them.
Decision Making Focus: Timeliness in Response Were the desired actions provided in a timely manner? (**Yes**)	Rapid timeliness • Able to act in correct order according to video simulation. • Able to discuss the impact of increased positive pressure masking.
Confidence Focus: Comfort Level and Confidence in the Room A. Did the NP appear comfortable in the procedural room? (**Yes**) B. Were there questions or concerns (hesitation) with using the machine? (**No**)	Comfort improved. • Appeared somewhat comfortable. • Stated more comfort with the response. • Little hesitation.
Additional Observations What went well/needs improvement?	Stated much improvement in confidence to perform actions after rewatching video scenario closer to the scheduled sim.
Debriefing Questions and Discussion	Video should be watched soon before the in-situ simulation, and if needed repeating the video simulation. Positive reinforcement given on improvement.

SIMULATION OBSERVER LOG (participant 4) 3/14/22 GI3

Action	Observation
Situational Awareness Focus: Knowledge and Understanding, Sharing Information A. Was he/she able to identify emergency drugs and what they were used for? (**Yes**) B. Able to grab the drugs quickly in emergency scenario? (**Yes**)	Very aware, no hesitation on entering the room verbalized actions. No issues with location of materials/drugs, can obtain drugs quickly

C. Did they understand how to respond to the laryngospasm scenario? (Explaining what they were doing during the simulation) (**Yes**)	
Decision Making Focus: Timeliness in Response Were the desired actions provided in a timely manner? (<3 min) (**Yes**)	Quick response, no hesitation Timely
Confidence Focus: Comfort Level and Confidence in the Room A. Did the NP appear comfortable in the procedural room? (**Yes**) B. Were there questions or concerns (hesitation) with using the machine? (**No**)	Appeared confident, very quick to turn O2 gauge up, APL valve up and O2 flush button to fill bag. Used proper pressure on bag. Comfort in setting: participant reported responding to similar situations in the west procedural rooms and conducting the same maneuvers.
Additional Observations What went well/needs improvement?	Prior to sim, participant stated apprehension with performing the in-situ simulation after a significant amount of time passed from watching the video.
Debriefing Questions and Discussion	Demonstrated ease with scenario and lead provided positive reinforcement. No further questions were asked.

SIMULATION OBSERVER LOG (participant 5) 3/14/22 (Monday GI3)

Action	Observation
Situational Awareness Focus: Knowledge and Understanding, Sharing Information A. Was he/she able to identify emergency drugs and what they were used for? (**Yes**) B. Able to grab the drugs quickly in emergency scenario? (**Yes**) C. Did they understand how to respond to the laryngospasm scenario? (Explaining what they were doing during the simulation) (**Yes**)	Responded quickly to call for help. Able to verbalize actions in correct order: O2 gauge, APL valve to 30, O2 flush, bag grasp. Verbalized understanding of scenario and need to increase system pressure for airway management. Identified the drugs quickly, able to locate and identify the emergency drugs on the top shelf of OmniCell.
Decision Making Focus: Timeliness in Response Were the desired actions provided in a timely manner? (<3 min) (**Yes**)	Actions were quick. Understood the APL valve measurement and was able to verbalize the mechanism of positive pressure airway management.
Confidence Focus: Comfort Level and Confidence in the Room A. Did the NP appear comfortable in the procedural room? (**Yes**)	Appeared confident in room. Minimal

B. Were there questions or concerns (hesitation) with using the machine? (**No**)	
Additional Observations What went well/needs improvement?	Stated improvement in response after a real-time airway emergency occurred in the same room and already did some of the same maneuvers. The video watched prior to the emergency helped knowledge in assisting with real-time emergency.\\\\\
Debriefing Questions and Discussion	Coming back into room and being a first responder in scenarios (earlier in the week was in a similar scenario in real-time) helped gain purposeful responsiveness.

SIMULATION OBSERVER LOG. (Participant 6) (3/18/2022 Friday GI3)

Action	Observation
Situational Awareness Focus: Knowledge and Understanding, Sharing Information A. Was he/she able to identify emergency drugs and what they were used for? (**Yes**) B. Able to grab the drugs quickly in emergency scenario? (**Yes**) C. Did they understand how to respond to the laryngospasm scenario? (Explaining what they were doing during the simulation) (**Yes**)	• Identified drugs immediately without hesitation. Was able to get into OmniCell quickly to locate sedation meds immediately. • Very knowledgeable on appropriately responding to emergency, was explaining rapidly what to do during scenario. Actions verbalized well. • This was the quickest simulation in the group.
Decision Making Focus: Timeliness in Response • Were the desired actions provided in a timely manner? (<3 min) (**Yes**)	Very timely. Already aware of correct actions.
Confidence Focus: Comfort Level and Confidence in the Room A. Did the NP appear comfortable in the procedural room? (**Yes**) B. Were there questions or concerns (hesitation) with using the machine? (**No**)	• Very comfortable in the room • Very comfortable with scenario.
Additional Observations What went well/needs improvement?	The video was a good refresher for the manual manipulation of the machine.
Debriefing Questions and Discussion	• NP has extensive background outside of anesthesia (hx of OR nursing, IR) and was not too concerned with the need to learn more. Watched video a few weeks ago and still was very confident d/t adequate baseline knowledge.

SIMULATION LOG. (Participant 7) (3/22/2022 Tuesday)

Action	Observation
Situational Awareness Focus: Knowledge and Understanding, Sharing Information A. Was he/she able to identify emergency drugs and what they were used for? (**No**) B. Able to grab the drugs quickly in emergency scenario? (**Yes**) C. Did they understand how to respond to the laryngospasm scenario? (Explaining what they were doing during the simulation) (**Yes**)	• Will need more education regarding anesthesia-related drugs, able to identify location of important drugs and mechanism. • Able to locate quickly. • Was able to explain actions during simulation.
Decision Making Focus: Timeliness in Response Were the desired actions provided in a timely manner? (<3 min) (**Yes**)	• Provided timely actions in correct succession. • Understood the pressure valve and O2 flow gauges. • Required more explanation about the APL valve.
Confidence Focus: Comfort Level and Confidence in the Room A. Did the NP appear comfortable in the procedural room? (**No**) B. Were there questions or concerns (hesitation) with using the machine? (**No**)	• Appears slightly uncomfortable but did not hesitate to use machine/turn on the anesthesia machine. • Performed actions adequately.
Additional Observations What went well/needs improvement?	Unusual to be in a procedural room and touching equipment, which caused some discomfort in the scenario. Required review on APL valve use.
Debriefing Questions and Discussion	• Asked appropriate questions about airways and the use of pressure: should they have an airway established by this time? Can they use this maneuver with just a mouthpiece? • Was feeling more confident d/t watching the video earlier in the day and the "material was fresher" and response was quicker. • Would use video and like another sim to refresh information in the future.

SIMULATION OBSERVER LOG (Participant 8) (3/22/2022 Tuesday)

Action	Observation
Situational Awareness Focus: Knowledge and Understanding, Sharing Information A. Was he/she able to identify emergency drugs and what they were used for? (**Yes**) B. Able to grab the drugs quickly in emergency scenario? (**Yes**)	Able to identify drugs, had extensive prior experiences with emergency drugs prior to video education. Able to retrieve drugs quickly.

C. Did they understand how to respond to the laryngospasm scenario? (Explaining what they were doing during the simulation) (**Yes)**	Verbalized reasoning behind actions.
Decision Making Focus: Timeliness in Response Were the desired actions provided in a timely manner? (<3 min) (**Yes**)	• Timely: was able to complete sequence within 3 minutes. • Able to verbalize actions and reasoning at time of sim. • Able to verbalize what the valves did.
Confidence Focus: Comfort Level and Confidence in the Room A. Did the NP appear comfortable in the procedural room? (**No**) B. Were there questions or concerns (hesitation) with using the machine? (**Yes**)	• Mildly apprehensive: "never touched a machine before" and wouldn't have felt comfortable without having some hands-on experience beforehand. • Some hesitation with turning knobs (attributed to the machine already being turned off). • Able to immediately turn O2 up, went appropriately to APL valve and turned up to appropriate pressure. • Good awareness of reasoning for increasing pressure and breaking spasm.
Additional Observations What went well/needs improvement?	• Stated lack of comfort with manipulating the machine due to lack of real-life response to such scenarios. Using the machine in a procedural room will help with comfort levels in responding to AE. • Practiced RCDP: had participant repeat the succession of actions to increase pressure in the circuit after the in-situ simulation was complete.
Debriefing Questions and Discussion	Remarks: "This was incredibly helpful because I was never taught this in training. Reading about the process of breaking a laryngospasm would not be helpful. Actually seeing and doing the actions make me feel more ready for something like this in real-life".

Appendix G

Post-Educational Survey (AllCounted.com)

1

*

The educational video and simulation increased my knowledge on locating equipment during an anesthesia emergency.

Strongly Disagree				Strongly Agree
1	2	3	4	5
○	○	○	○	○

2

This training improved my knowledge on how to assist during a laryngospasm.

Strongly Disagree				Strongly Agree
1	2	3	4	5
○	○	○	○	○

3

*

This learning activity increased my confidence in responding to an anesthesia emergency.

Strongly Disagree				Strongly Agree
1	2	3	4	5
○	○	○	○	○

4

My instructor provided helpful feedback after the simulation.

Strongly Disagree				Strongly Agree
1	2	3	4	5

5

I was able to easily access the educational video online.

Strongly Disagree				Strongly Agree
1	2	3	4	5

6

How many times did you watch the video?

7

How long was the time between watching the video and performing the in-situ simulation (in days)?

8

How many years of employment in the anesthesia department:

9

*

What are the perceived barriers to education in the department, if any?

Appendix H

CLINICAL QUALITY IMPROVEMENT CHECKLIST

CLINICAL QUALITY IMPROVEMENT CHECKLIST		
Date: **4/2/2021**	**Project Leader:** **Sara Durgerian**	
Project Title: **Implementation of a Competency-Based Online Learning Tool to Improve Anesthesia Nurse Practitioner Self-Efficacy in Responding to Anesthesia Emergencies**		
Institution where the project will be conducted: **Beth Israel Deaconess Hospital, Boston, MA**		
Instructions: Answer YES or NO to each of the following statements about QI projects.	**YES**	**NO**
The specific aim is to improve the process or deliver of care with established/ accepted practice standards, or to implement change according to mandates of the health facilities' Quality Improvement programs. There is no intention of using the data for research purposes.	**X**	
The project is **NOT** designed to answer a research question or test a hypothesis and is **NOT** intended to develop or contribute to generalizable knowledge.	**X**	
The project does **NOT** follow a research design (e.g. hypothesis testing or group comparison [randomization, control groups, prospective comparison groups, cross-sectional, case control]). The project does **NOT** follow a protocol that over-rides clinical decision-making.	**X**	
The project involves implementation of established and tested practice standards (evidence based practice) and/or systematic monitoring, assessment or evaluation of the organization to ensure that existing quality standards are being met. The project does **NOT** develop paradigms or untested methods or new untested standards.	**X**	
The project involves implementation or care practices and interventions that are consensus-based or evidence-based. The project does **NOT** seek to test an intervention that is beyond current science and experience.	**X**	
The project has been discussed with the QA/QI department where the project will be conducted and involves staff who are working at, or patients/clients/individuals who are seen at the facility where the project will be carried out.	**X**	
The project has **NO** funding from federal agencies or research-focused organizations, and is not receiving funding for implementation research**.**	**X**	
The clinical practice unit (hospital, clinic, division, or care group) agrees that this is a QI project that will be implemented to improve the process or delivery of care.	**X**	
The project leader/DNP student has discussed and reviewed the checklist with the project Course Faculty. The project leader/DNP student will **NOT** refer to the project as research in any written or oral presentations or publications.	**X**	
ANSWER KEY: If the answer to **ALL** of these questions is **YES**, the activity can be considered a Clinical Quality Improvement activity that does not meet the definition of human research. **UMB IRB review is not required**. **Keep a dated copy of the checklist in your files.** If the answer to ANY of these questions is NO, the project must be submitted to the IRB for review.		

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