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Standardizing Evaluation Methods for Simulation

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Introduction of the Problem

The American Association of Nurse Anesthetists recognizes that stress is prevalent in student registered nurse anesthetists (SRNAs) and highlights the importance of stress reduction and wellness in all CRNA programs (AANA, 2021b). SRNAs experience many significant sources of stress, including fear of making medical errors, learning and mastering numerous new skills, and experiencing a high level of autonomy. High stress levels can negatively impact the ability to provide safe and appropriate patient care (Chipas et al., 2012). In addition, SRNAs frequently rotate to different clinical sites every five weeks, thus making it necessary to learn the unique protocols of numerous institutions and preceptors.

Repeated exposure to high-fidelity simulation (HFS) has been shown to reduce stress, decrease anxiety, and increase self-confidence. (Labrague, McEnroe, Bowling, Nwafor, Tsaras, 2019; Pal, Kumar, Soe, & Pal, 2018). The addition of HFS to the curriculum allows SRNAs to gain experience with both critical scenarios and skills practice (Turcato, Roberson, & Covert, 2008). When simulation is integrated into the nursing curriculum it is important for educators to adequately evaluate student learning and perceptions from the activities (Adamson & Kardong-Edgren, 2012). Unfortunately, there are few standardized instruments available to nurse educators (Adamson et al., 2012).

While the original purpose of the project was to develop, conduct, and evaluate a simulation boot camp for SRNAs, the Covid-19 epidemic required that the project be changed. The new project served as the first step toward developing standardized evaluation instruments for a Midwestern University's Department of Nurse Anesthesia.

Literature Review

A literature review was conducted to evaluate the usefulness of HFS in nurse anesthesia education. More specifically, the objective was to explore the effect of simulation on SRNA stress levels, readiness for critical scenarios, and in turn, the effect on patient care. The results of the literature review revealed several ways in which HFS can positively contribute to the education of anesthesia providers.

The SRNA population has been shown to be especially vulnerable to the negative consequences of stress (Frazier, Gabriel, Merians, & Lust, 2019; Javeth, 2018). Stress can cause forgetfulness, preoccupation, and decreased confidence, which can negatively impact clinical performance (Chipas et al., 2012). Repeated exposure to simulation scenarios has been shown to decrease stress and anxiety levels and increase self-confidence in participants (Kaddoura, 2010; Labrague, McEnroe, Bowling, Nwafor, Tsaras, 2019; Morton, Powers, Jordan, & Hatley, 2019; Pal, Kumar, Soe, & Pal, 2018). Students have reported feeling more confident and better prepared for clinical practice after having participated in HFS (Brien, Charette, & Goudreau, 2017; Partin, Payne, & Slemmons, 2011). In addition, HFS has been linked to increased knowledge, improved performance, and better skills acquisition when compared to traditional instruction (Aqel & Ahmad, 2014; Gates, Parr, & Hungnen, 2012; Gonzalez et al., 2013; Morton et al., 2019).

Providing education specific to anesthesia providers presents a unique challenge; anesthesia crises, though devastating, are rarely encountered in practice (Erlinger, Bartlett, & Perez, 2019). Simulation is a reasonable method for exposing anesthesia providers to these low-frequency, high-impact events (Parsons, Kuszajewski, Merritt, & Muckler, 2019). HFS allows participants to gain experience with these rare complications, such as malignant hyperthermia,

pediatric laryngospasm, and anesthesia machine failure (Ambardekar et al., 2019; Cain, Riess, Gettrust, & Novalija, 2014; Mejia, Gonzalez, Delfino, Altermatt, & Corvetto, 2018; Parsons et al., 2019; Ross, Rebella, Westergaard, Damewood, & Hess, 2016; Stewart, Williams, Stedeford, & Cornes, 2016; Waldrop, Murray, Boulet, & Kras, 2009). Because SRNAs have reported fear of making medical errors as a significant source of stress (Phillips, 2010), preparing for these events and increasing crisis-management competency through HFS may help alleviate these fears.

Given the strong evidence of the benefits of HFS, nursing education organizations such as the National Council of State Boards of Nursing and the National League of Nursing support the use of simulation in education (Labrague et al., 2019). The American Association of Nurse Anesthetists is also supportive of simulation science in the education of nurse anesthetists (AANA, 2021a).

Project Methods

The original goal of this project involved the development and implementation of HFS at the JUMP Trading Simulation and Education Center (JUMP) in Peoria, Illinois. Simulations for this project were written as a bootcamp for SRNAs and focused on skills development and preparation for critical events that can occur in the operating room setting. In order to determine the effectiveness of the bootcamp, student participants would have been asked to evaluate each simulation. This simulation bootcamp would have served as an orientation for SRNAs attending a clinical site affiliated with JUMP.

Due to restrictions related to COVID-19, JUMP was unable to accommodate the original plan to implement simulations for SRNAs. In order to remain compliant with social distancing guidelines, the project goals were changed at the recommendation of the project stakeholder.

JUMP uses the Value Analysis Model to evaluate every simulation that is implemented at their facility, and the stakeholder for this project agreed to share knowledge and expertise to help others understand the model and its application. The new project involved learning the Value Analysis Model and related evaluation methods, and then providing education to simulation-focused faculty at the university. The Value Analysis Model provides the framework for standardizing tools to evaluate simulation participant perceptions, applicability of material, concepts learned, and financial impact (Buzachero, Phillips, Phillips, & Phillips, 2013). The overall objective of the newly designed project was to provide the foundation for standardizing the way simulation is evaluated, specifically in the Department of Nurse Anesthesia at the university.

These student authors engaged in extensive self-education using materials and texts to learn about the Value Analysis Model. They then met with the project stakeholder and other team members to discuss the model and how it is used to evaluate programs at JUMP. This meeting provided insight and real-life examples of how the Value Analysis Model can be used to inform and guide simulation evaluation in a medical education setting. Information obtained from this meeting included estimated costs of implementing a simulation bootcamp for CRNAs and examples of JUMP's evaluation instruments.

A meeting was then held with the coordinator of the university's Simulated Learning Center for Health Sciences to plan for project implementation. After learning about the proposed topic, the coordinator helped identify a target audience that extended beyond the university and to interested parties in the community. The coordinator arranged for a presentation to occur during a monthly Zoom meeting for the St. Louis Simulation Interest Group (SLSIG). University faculty and the three first year SRNAs were also invited to attend.

A fictional scenario was integrated into a PowerPoint presentation to provide education on calculating return on investment for simulation using the Value Analysis Model. In this fictional scenario, a chief CRNA identified that the attrition rates at her facility were double the national average. She performed a literature search to develop new training aimed at decreasing turnover, and decided to implement a simulation training program. After implementation, she used the Value Analysis Model to evaluate her results. As program participants were walked through this scenario, they learned how to write evaluations, interpret data, and calculate return on investment. Though the scenario was imagined, the data that was used for attrition rates, simulation implementation costs, and training costs represented actual numbers that were taken from JUMP and the literature. The stakeholder from JUMP served as a content expert and answered questions and provided details of her experience using this model.

An additional goal of the project was to ensure that the original simulations written for the orientation bootcamp could be implemented for future cohorts of students. The sponsoring university recently received state funding to build an innovative, state-of-the-art simulation center comparable to JUMP. Information from the original project was shared with three first-year anesthesia students. These students will use and build upon this information to design a simulation bootcamp for their classmates, ideally at the new university simulation center. These students will use the Value Analysis Model to evaluate their project outcomes.

Evaluation

The project was evaluated using a mixed methods approach. Surveys were designed using the Value Analysis Model and consisted of eight five-point Likert scale and two open-ended questions. The goals for evaluation, as outlined by the Value Analysis Model, included measuring participant perceptions, participant learning, and content application and

implementation. After the survey was created using Qualtrics, it was reviewed and approved by both the project team leader and the project stakeholder from JUMP. A link to the evaluation was sent to participants via the Zoom chat box at the end of the presentation for immediate completion. The evaluation survey was kept anonymous through measures put into place by Qualtrics. Immediate oral feedback was also received from the leader of SLSIG; she expressed strong interest in using this model in her practice.

In order to evaluate perceptions, participants were asked if the presentation was engaging and the material presented was relevant and important. All responses were favorable, with most participants answering that they strongly agreed. Two open-ended questions to measure perception and learning were included in the survey. Multiple participants stated that learning how to calculate return on investment (ROI) for simulation was most relevant to their work. Participants were also asked to evaluate what they learned during the presentation. Responses were again favorable; all participants agreed that they gained a basic knowledge of the value analysis model and how to apply it to simulation. To measure application and implementation, participants were asked if they felt prepared to use the Value Analysis Model to calculate ROI. They were also asked if they intended to use the information to evaluate future simulations. All participants agreed that they had the knowledge and planned to implement the Value Analysis Model into their simulation evaluation methods.

Evaluation data was limited first by the number of participants. Though over 70 invitations were sent, only 16 people attended the presentation. Factors such as inclement weather and virtual format likely limited the ability for some to participate. In addition, COVID-19 has caused many facilities to cease in-person learning and therefore simulations; this factor

may have decreased the level of interest in the project topic and decreased the number of personnel available for the presentation.

Impact on Practice

After the presentation, a second meeting with the university simulation coordinator took place to discuss plans for implementing the evaluation methods at the new simulation center. In order to facilitate this process change, a binder was created to provide information and resources on the Value Analysis Model. This binder was also given to the university faculty member responsible for coordinating simulations within the anesthesia department. Both parties indicated they plan to use this information in the future to assist in the development of evaluation instruments.

The second goal of this project, simulation bootcamp sustainability, was made possible through meetings with the first-year SRNAs. In the future, these students plan to implement the bootcamp originally designed for this project using the simulation center at the university. The students were given previously written simulations, information shared from JUMP, and the Value Analysis Model information binder that was created.

Conclusions

Even though the goals shifted from what was originally planned, the implementation of this project positively impacted the simulation community within and outside of the university. Simulation in nursing education has benefits that are widely acknowledged in the literature. The importance of including HFS in the University Department of Anesthesia curriculum has been established. This project ensured that the bootcamp will be implemented for future cohorts of SRNAs and that the evaluation methods will be standardized using the Value Analysis Model.

Data obtained using this model will be integral to the continued revision and improvement of HFS education.