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Development of Evidence-Based Rubrics and Instructional Videos for Anesthesia Induction Sequences

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Executive Summary

Introduction of the Problem

Typical sequence induction and rapid sequence induction (RSI) are methods used to establish general anesthesia. A multitude of patient and procedural factors influence which approach is used. Standardized protocols provide a dependable approach for educating student registered nurse anesthetists (SRNAs) in anesthesia induction sequences. Due to legal, ethical, and patient safety concerns, teaching the motor skills and routines for medical procedures can be challenging. Although classroom didactic and physical training are necessary, observational learning can help to further enhance motor abilities for high-level skills. Observational learning is based on the mirror neuron system, which states that watching a person complete a task can help the learner understand it better (Cordovani & Cordovani, 2016). Observational learning, when combined with physical practice, can result in better knowledge transfer than physical practice alone (Cordovani & Cordovani, 2016).

The aim of this project was to update the existing Southern Illinois University-Edwardsville (SIUE) Nurse Anesthesia Program's typical sequence induction and RSI protocols and provide instructional videos for the course NURS 529-Orientation to Nurse Anesthesia Practicum. The current protocols were last revised in 2006; therefore, a need was identified to update the protocols with the most recent evidence. Furthermore, there is a lack of resources for current students to utilize observational learning, a technique that has been proven effective in obtaining clinical skills.

Literature Review

Both induction sequences begin with a standardized room set-up to ensure a safe environment. Jelacic et al. (2019) proposed a 16-item aviation style checklist that can be utilized

for both standard induction and RSI. Next, the patient should be evaluated utilizing multiple airway assessments (Mahmoodpoor, 2017). Once ready for intubation, the patient should be properly positioned in the sniffing position with the head on a 5cm pillow (Acharya et al., 2019). Once endotracheal tube placement has been confirmed with the presence of end tidal CO2, symmetrical chest rise, and appropriate tube depth, the endotracheal tube should be secured with clean single-use tape (Sitzwohl et al., 2010 & Krug et al., 2011). Providers should employ a double-glove technique for added cleanliness (Jaffe, 2019).

Administration of positive pressure ventilation (PPV), timing and selection of anesthetic drugs, and application of cricoid pressure are all notable distinctions between typical induction and RSI. Typical induction usually involves PPV throughout the induction sequence. In general, PPV is contraindicated in RSI because it increases the risk of pulmonary aspiration of gastric contents (El-Orbany & Connolly, 2010). Modified RSI includes light PPV with or without cricoid pressure (maintaining inspiratory pressures below 15 cmH2O) and is considered an option for patients at high risk of desaturation and hypoxia with apnea (Klucka et al., 2020).

Although paralytic agents are required for both sequences, different medicines are used. Rocuronium is commonly used for typical induction due to its medium duration of action and relative speed of onset (Chatrath et al., 2010). Succinylcholine is most utilized in RSI because of its rapid onset and offset, assuming no contraindications are noted to its use (El-Orbany & Connolly, 2010; Klucka et al., 2020).

Cricoid pressure remains a standard of care for RSI, although there is much research attempting to discredit its use (Birenbaum et al., 2019). Research notes that many providers do not administer cricoid pressure correctly, negating its potential to reduce gastric aspiration.

Regular training is suggested to reduce variation in the delivery of cricoid pressure (Birenbaum et al., 2019; Klucka et al., 2020).

Observational learning has been proven effective teaching higher cognitive motor processes such as induction sequences (Cordovani & Cordovani, 2016). The benefit of observational learning is further augmented when the learner is exposed to both a novice and an expert performing the skill (Andrieux & Proteau, 2013). Debriefing and personal reflection after an educational experience are beneficial for developing and strengthening both short and long-term information retention, as well as boosting learner confidence and self-esteem (Kirkpatrick & MacKinnon, 2012). When teaching typical induction and RSI protocols to the novice provider, observational learning can be used to ensure that the learner understands both the motor skills and physical processes required for each procedure.

Project Methods

Purpose, Goals, and Setting

The purpose of this project was to update the typical and RSI rubrics and create instructional videos for the foundational anesthesia course NURS 529- Orientation to Nurse Anesthesia Practicum at SIUE. Rubrics for these skills had not been updated with current best-practice recommendations since 2006. Instructional videos were created to facilitate understanding via observational learning. This project was conducted at SIUE. The project design was a non-experimental single group design. The study group consisted of current first-year SRNAs enrolled in NURS 529. The SIUE Institutional Review Board reviewed and approved this project on November 19, 2021.

Evaluation

Implementation

The updated rubrics and instructional videos were presented to the SRNAs on February 7 and 9, 2022 during required lab experiences. Prior to lab, the students completed an anonymous 20-question multiple choice pre-test assessing baseline knowledge of anesthesia induction sequences. The pre-test was made available on Blackboard and was linked to Qualtrics where the students completed the online exam. The students did not view their scores after the pre-test. Once in lab, the students were shown a total of four videos to illustrate typical sequence induction and RSI. The videos showed each induction sequence performed by a novice and by an expert. After viewing the videos, students were encouraged to practice the induction sequences in lab. One week after the lab, the students completed an identical 20-question post-test. Again, the test was anonymous, was available via Blackboard, and students did not view their scores. At this time the students also completed a post-implementation evaluation that consisted of fourteen Likert style questions and five free response questions evaluating the overall educational experience and utility of the updated learning materials.

Results

Overall test scores improved from pre-test to post-test. There were 29 total respondents for the pre-test with scores ranging from 50%-100% and an average score of 78%. The most missed questions included contraindications to succinylcholine administration, when it is appropriate to mask ventilate during an RSI, and Cormack-Lehane views obtained with a plastic disposable blade compared to a metallic blade. The post-test had a total of 20 respondents with scores ranging from 75%-100% and an average of 89%. While the average post-test score was higher, the most missed questions were the same as the pre-test.

The post-implementation evaluation was completed by 21 participants. Most respondents were promotors (ratings of 9-10 on the Likert scale). When asked if the videos enhanced

understanding of a typical and rapid sequence induction respondents were overall promoters at 67% and 71% respectively. The lowest promoter scores occurred on questions that rated confidence in performing the induction sequences. Confidence in performing a typical sequences induction showed 14% promoter, 62% passive, 24% detractor. Confidence in performing an RSI showed 19% promoter, 57% passive and 24% detractor. These results indicate that further practice and experience, both in lab and on real patients, is needed to gain confidence with these high-level skills.

Limitations.

Sample size and overall participation was a significant limitation to this project. There were 29 pre-tests completed versus 20 post-tests despite online and emailed reminders. This could be attributed to the fact that no letter grade, points, or penalties were tied to this project, perhaps adversely affecting student motivation to complete the exercise. Furthermore, the pre- and post-test were completed anonymously and unpaired. Individual scores cannot be compared; rather, only the entire class scores can be compared, and no statistically significant change can be extrapolated.

Impact on Practice

Overall, this project can positively impact the SIUE Nurse Anesthesia Program now and in the future. The immediate impact is that the SRNAs have access to updated evidence-based induction sequence rubrics and videos to aid in learning these fundamental anesthesia skills. Mastery of these skills will allow the SRNAs to provide the best care to patients in the clinical setting. Long term, these materials will serve as a reference and guide for future SIUE SRNAs learning these skills.

Although the rubrics and videos serve as a reputable reference at the current moment, all materials will need to be updated when new literature guidelines emerge. This project paves the way for future projects and can be built upon by updating the existing rubrics for additional anesthesia skills (i.e., epidural placement, spinal placement). Positive responses to the instructional videos validate observational learning as an effective teaching method and highlight the need for creation of further videos to accompany any skills rubrics**.**

Conclusion

Safe and effective induction of anesthesia is a fundamental skill for every anesthesia provider. Although both typical sequence and rapid sequence induction are common procedures, much variance in technique exists among providers. Clear, standardized rubrics are an important element in teaching these skills. The purpose of this project was to update the typical and rapid sequence induction rubrics for the SIUE Nurse Anesthesia Program with the current best practice recommendations. To utilize observational learning, instructional videos were created to accompany the updated rubrics. These materials were presented to the SRNAs in the course NURS 529 - Orientation to Nurse Anesthesia Practicum prior to beginning clinical rotations. Results showed that scores improved between the pretest and posttest indicating a potential gain in knowledge and skills. Survey results indicated overall buy in and acceptance of the new materials by the SRNAs. These results highlight the importance of multimodal learning in mastering critical, high-level skills such as induction of anesthesia.

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