

The Impact of Cognitive Aids in Simulation Learning on Perception of Clinical Preparedness

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Abstract

Cognitive aids are used in multiple professions to enhance crisis management skills of individuals. Simulation learning is used in all Doctor of Nurse Anesthesia Practice Programs. The simulated clinical experiences may include high fidelity simulation with or without the use of a cognitive aid and has been shown to be of value to medical professions to bridge didactic learning with the delivery of safe patient care. However, the relationship between the use of cognitive aids in simulation learning of Student Registered Nurse Anesthetist and their perception of clinical preparedness has not been assessed. The purpose of the scholarly project is to determine “The Impact of Cognitive Aids in Simulation Learning on Perception of Clinical Preparedness”

Keywords: *Simulation learning, student registered nurse anesthetist, cognitive aids, perception of clinical preparedness*

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The Impact of Cognitive Aids in Simulation Learning on Perception of Clinical Preparedness

Algorithms, checklists, emergency manuals, and visual aids are used to manage high stress situations and guide decision making (Clebhone, Watkins, & Tung, 2020; Gardner et al., 2018., Watkins et al., 2016.). These tools can be broadly referred to as cognitive aids and have been successfully implemented in a variety of professional settings including aviation, nuclear powerplants, and clinical medicine to improve safety (Gangadharan et al., 2018; Gleich et al., 2019; St Pierre, Breuer, Strembski, Schmitt, & Luetcke, 2017). Cognitive aids can also improve clinical preparedness and self-efficacy of course participants when used in learning scenarios (Gardner, 2018; Martin, 2017; Trujague, 2019). Anesthesia providers are confronted with critical events that require interventions and could benefit from a decision-making resource. To improve Student Registered Nurse Anesthetist's (SRNA) perception of clinical preparedness, the use of cognitive aids in simulation learning will be investigated. The newfound insight will direct a clinical innovation question aimed to optimize SRNA perception of clinical preparedness.

Significance and Background of Clinical Problem

SRNAs utilize simulation learning to practice procedures, enhance situational awareness, hone critical thinking skills, and develop crisis management skills. This controlled environment allows students to practice while ensuring complete patient safety (Wunder, 2016, Council on Accreditation of Nurse Anesthesia Educational Programs, 2020). It is a requirement of the Council on Accreditation of Nurse Anesthesia Educational Programs (COA) that Doctor of Nurse Anesthesia Practice (DNAP) programs incorporate simulated clinical experiences into the curriculum (COA, 2020). After completing the didactic, simulation, and clinical requirements the SRNA is then eligible to take the National Certification Examination to become a Certified Registered Nurse Anesthetist (CRNA). According to the American Association of Nurse

Anesthetists (AANA), over 2,400 CRNAs join the profession every year (Education of Nurse Anesthetists in the United States at a Glance, 2020).

SRNAs in many DNAP programs prepare to enter independent practice as CRNAs by participating in simulated clinical experiences that can include high fidelity simulation and may or may not incorporate the use of a cognitive aid. It has been shown that simulated learning can be of value to medical professions to bridge didactic learning with the delivery of safe patient care (COA, 2020, Gardner, 2018). During their education SRNAs spend a required 2,000 hours delivering patient care in the clinical arena. The hours spent in clinical are one of the major contributing factors to stress in the SRNA (Jimenez, Navia-Osorio, & Diaz, 2010). It can be theorized that increasing their perception of clinical preparedness could decrease stress.

Therefore, it is essential to the practice of nurse anesthesia to determine if the use of cognitive aids in simulation learning scenarios affects SRNA's perception of clinical preparedness. Despite the use of cognitive aids in DNAP 701 at AdventHealth University (AHU) the SRNA's perception of clinical preparedness has not been assessed. The purpose of this scholarly project is to evaluate the perception of clinical preparedness among SRNAs participating in simulation education using a cognitive aid at AHU.

PICOT Evidence Review Questions

Two questions in PICOT format have guided a systematic review of literature. Clinical problem question: How do Student Registered Nurse Anesthetists (P) using cognitive aids during clinical simulation learning scenarios (I) perceive their clinical preparedness (O) compared to Student Registered Nurse Anesthetists in clinical simulation learning scenarios without cognitive aids (C)?

The second focuses on clinical innovation: In Student Registered Nurse Anesthetists at AdventHealth University in graduating cohort 2023 (P), does simulation learning scenarios with the use of the Stanford Emergency Manual as a cognitive aid (I) compared to simulation learning scenarios without a cognitive aid (C) affect the Student Registered Nurse Anesthetists' perception of clinical preparedness (O) within one academic trimester (T)?

Search Strategies

The search strategy included the following databases: CINAHL, Cochrane Central Register of Controlled Trials, Google Scholar, and PubMed. A total of ninety-five articles were initially retrieved after review of abstracts, seventeen articles were eligible for full-body screen, and then ten studies met inclusion criteria. These studies encompass assessment of preparedness after the use of a cognitive aid both in the field of anesthesia and other professions. Studies assessing preparedness but not utilizing a cognitive aid, and lack of relevance to the specific topic were excluded. The design of the ten studies that were included are a retrospective analysis, a cross sectional observational study, a randomized control trial, and multiple cohort studies. Key Search Terms: Student Registered Nurse Anesthetist AND Cognitive Aid, Cognitive Aid AND Preparedness. The Search Limits were: English language, human subjects, peer reviewed, and within the last five years.

GRADE Criteria

The literature was evaluated using the Grading of Recommendation Assessment, Development and Evaluation (GRADE) criteria. The level of evidence advocating for the use of cognitive aids during simulation education to affect the SRNA's perception of clinical preparedness was initially a moderate-4. Included in the review is a retrospective analysis, a cross sectional observational study, a randomized control trial, and multiple cohort studies which

dictated the initial GRADE. As part of the assessment for risk of bias, allocation of concealment among groups was appraised. Some studies were blinded, while others admitted that neither participants nor managers of information were blinded. Multiple studies among the literature used voluntary responses that may owe to social desirability bias. Considering these risks of bias, the literature GRADE was graded down 1. No inconsistencies were found in the results throughout the studies. The body of literature is direct because the intervention of using a cognitive aid in some form was incorporated into practice in the studies. There is a significant risk of imprecision because most of the sample sizes are small making it difficult to detect any real effects of interventions. The imprecision noted within the body of literature dictated an additional down-rating 1. No publication bias is noted in the studies assessed. These down ratings resulted in a low 2 overall GRADE score (see Appendix for Matrix Tables).

Based on the quality of evidence available, a recommendation can be made that SRNA's perception of clinical preparedness is affected by the use of cognitive aids in clinical simulation.

Literature Review and Synthesis of Evidence

Overview

The literature examined many variables in relation to cognitive aids and perception of clinical preparedness. To follow will be a description of the operational definitions, a review of the literature, and theoretical framework. A comprehensive scientific literature review was conducted to examine the use of cognitive aids, barriers to implementing cognitive aids into clinical practice, and users' perceptions of cognitive aids.

Operational Definitions

For this scholarly project cognitive aid is defined as an emergency manual, visual aid, or checklist that exists in digital or paper form to assist users in managing critical high-stress

clinical events (Clebone, Watkins, & Tung, 2020; Gardner et al., 2018., Watkins et al., 2016.). Perception of clinical preparedness is the SRNA's subjective impression of their readiness to enter the clinical setting as a student. The course DNAP701: Integration/Clinical Correlation at AHU promotes synthesis of current anesthesia topics and research through review and application of current anesthesia literature, as well as presentation and discussion of morbidity and mortality of clinical cases. The methods of instruction include lecture, discussion presentations, simulation scenarios, and written assignments. Throughout the course the *Emergency Manual: Cognitive Aids for Perioperative Critical Events* is used for crisis management during the simulation scenarios. According to Stanford Anesthesia Cognitive Aid Group (2016), "Effective use [of the manual] has included pre-event review, post-event team debriefing, and 'during' critical event management—the latter particularly after adequate help has arrived or when the patient is sufficiently stable for a clinician to pause from acute care actions".

Literature Review

It is possible that cognitive aids can contribute to SRNA's perception of clinical preparedness because the use of a cognitive aids improved users management of crisis situations (Gardner, 2018;Gleich, 2019).

Use of Cognitive Aids

Cognitive aids have been researched in a variety of simulated settings including pediatric emergencies, intraoperative emergencies, and radiological emergencies (Gangadharan, 2018; Gardner, 2018; St Pierre et al, 2017). Most of the literature compared groups of users that used a cognitive aid, against those who did not use a cognitive aid. The cognitive aids were available in several different forms including laminated posters, digital format, and handheld paper (Gardner,

2018; Gleich, 2019; Watkins, 2016). The body of evidence did not reveal what cognitive aid method was superior but rather urges the various disciplines to use the cognitive aid that best suits its user's needs. However, when the use of electronic versus paper cognitive aid was assessed sixty-two percent of SRNAs preferred the use of paper (Watkins, 2016). The implementation of cognitive aids were almost exclusively done in simulated learning scenarios so that patient care was not affected. This limits the evidence that cognitive aids will change real-world practice (Clebene, 2020; Gangadharan, 2018). Prior to implementing the use of a cognitive aid these variables should be considered in order to properly affect change of clinical preparedness.

Barriers to Implementation

Clinicians are skilled providers that encounter critical situations and have been trained to handle these events, but the use of a cognitive aids has not been fully embraced during these emergencies (Clebene, 2020; Gleich, 2019). Nevertheless, when cognitive aids were made available to providers in the clinical setting, they reported more frequent use and felt more comfortable with their use (Gangadharan, 2018; Mazer et al., 2017; Storm, 2016). Learners in simulated education scenarios preferred to manage emergency situations using the cognitive aid over depending on memory alone (St Pierre, 2017; Watkins, 2016). Based on these findings, it could be hypothesized that increasing knowledge and availability of cognitive aids will increase their use and thus warrants further investigation.

Effect on Preparedness

Several studies discussed simulation scenarios of different critical events with and without cognitive aids available to the participants; the experiences of participants were then compared. When cognitive aids were used in simulation learning, user's reported improved

perceptions of preparedness and self-efficacy as compared with simulation experiences without cognitive aids (Gangadharan, 2018; Gardner, 2018; Martin, 2017; Tujague, 2019). Additionally, users reported feeling more comfortable in scenarios not encountered regularly in their practice with algorithm-based management and made less errors (Gangadharan, 2018; Gardner, 2018). Cognitive aids used outside of simulation scenarios and in clinical practice were rated by users to be beneficial in emergency situations and made workflow more efficient (Storm, 2016; Mazer, 2017).

Theoretical Framework

AHU has already implemented the use of cognitive aids into SRNA's simulation education, hence an assessment of SRNA's self-efficacy is warranted. Therefore, for this scholarly project the Bandura Social Cognitive Theory of Self-efficacy will be used as the framework to analyze the findings.

Bandura's Social Cognitive Theory of Self-efficacy highlights the relationships between cognitive, behavioral, personal, and environmental factors in determining an individual's motivation and behaviors (Bandura, A., 1982). This theoretic framework supports the notion that individuals perform superiorly in difficult situations if they have a high self-perception of efficacy. When SRNAs participate in simulation learning there is potential for improvement of self-efficacy that could expand their perception of preparedness for clinical practice as students. Sending SRNAs into the clinical environment who feel prepared benefits nurse anesthesia education and practice.

The General Self-efficacy (GSE) Scale was designed to assess the strength of the individual's belief in their ability to respond to a difficult situation and to deal with any barriers (Schwarzer, R., & Jerusalem, M., 1995). According to Schwarzer, R., & Jerusalem, M. (1995),

one's perception of self-efficacy can be connected to an individual's behavior. Therefore, the GSE will be used to evaluate SRNAs perception of clinical preparedness because it is relevant in relationship to clinical practice and behavior change.

Applicability to Practice

As SRNAs leave the education environment and enter the profession of anesthesia they should be equipped to “plan and deliver anesthesia, pain management, and related care to patients of all health complexities across the lifespan”, per the AANA's *Scope of Nurse Anesthesia Practice* (2020). For this reason, education of SRNAs should rely on evidence-based practice to ensure they contribute to the growth of the anesthesia profession. Based on the evidence from the body of literature implementing cognitive aids into simulated learning has the potential to improve the perception of clinical preparedness of the SRNA and has been investigated further by this scholarly project.

Project Aims

The primary aim of this scholarly project is to determine if the use of cognitive aids during clinical simulation has a statistically significant impact on AHU DNAP cohort 2023 perception of clinical preparedness. The objectives of this primary aim are as follows:

1. Evaluate the AHU DNAP cohort 2023 perception of clinical preparedness prior to the implementation of cognitive aids in a simulated scenario of an anesthesia-related crisis in DNAP 701 in the Spring trimester of 2021.
2. Appraise the AHU DNAP cohort 2023 perception of clinical preparedness after the implementation of cognitive aids in a simulated scenario of an anesthesia-related crisis in DNAP 701 in the Spring trimester of 2021.

3. Make evidence-based recommendations to AHU DNAP program for the appropriate implementation of cognitive aids in nurse anesthesia simulation education at AHU for Spring trimester of 2022.

Methods of Research

This scholarly project will be a quasi-experimental design that is both quantitative and prospective. This bivariate study will examine both dependent and independent variables including SRNA's perception of clinical preparedness and cognitive aid in simulation learning, respectively. The design of this scholarly project was selected to test the difference between the naturally occurring variables of using the *Emergency Manual: Cognitive Aids for Perioperative Critical Events* in DNAP 701 and its effect on the perception of clinical preparedness in SRNAs.

The project team selected a small private Christian University in the Southern United States, AdventHealth University, as the site and setting of this scholarly project. The sampling technique was convenience sampling and included AHU SRNAs in the graduating cohort 2023. The sample size of approximately thirty SRNAs and was noted to be a small sample size by the scholarly project team. Inclusion criteria of the participants was SRNAs who had been admitted to the DNAP program and have completed DNAP 725, DNAP 735, and DNAP 740, as these are the prerequisites to the course DNAP 701. Exclusion criteria was individuals who exit the DNAP program prior to beginning the third trimester of learning. This group of individuals was not identified as a vulnerable population. Participants in the study were students taking DNAP 701 at the time of implementation in the Spring of 2021 and were voluntarily recruited. The scholarly project team addressed the DNAP cohort of 2022 during scheduled in person class on January 22, 2021. The students were provided with a QR code linked to the pre-survey on Microsoft Forms. The method of instrumentation of this project used a modification of the GSE scale,

available to participants on a secure electronic platform, Microsoft Forms. This survey was only be modified after receiving permission to use this validated tool from its author. Consistent with the original design of the survey, Likert scale format was used. The course instructors, Dr. Manuel Tolosa and Dr. Steven Fowler notified the participants of the availability of the survey prior to beginning DNAP 701 in February 2021. The post survey was made available in the same fashion to the cohort of 2023 after completing DNAP 701 in April 2021. Although, formal consent was not required it was made clear to those who participated that it was completely voluntary. To ensure privacy of the participants, students created an anonymous personal identifier by typing the three-letter abbreviation for their mother's birth month and their current street address (example: Apr601). This student specific identifier was used when completing both surveys on Microsoft Forms.

The data gained from the surveys was entered into data analysis software and then evaluated by the scholarly project team. A dependent t-test was performed using Statistical Package for Social Sciences (SPSS) software version 21.0, with the assistance of statistician Dr. Roy Lukman. A dependent t-test was used to determine if statistical significance existed between the variables. The survey responses were compiled on a excel spread sheet and stored on a secured drive. To maintain privacy of the participants, this information along with the data analysis findings was be accessible by Alyssa Cinquemani, Emily Jones, Dr. Roy Lukman, and the scholarly project chair Dr. Manuel Tolosa and Dr. Steven Fowler via the secure network of Microsoft SharePoint. The file on the storage cloud will be auto-deleted after seven years.

Planning, Procedures, and Limitations

Planning

Key stakeholders were identified based on their knowledge of graduate nurse education and the insight they can provide for this scholarly project. The following stakeholders were selected: Dr. Carolyn Ramsey- associate professor in the Nursing Department at AHU, Dr. Steven Fowler- faculty member of the DNAP program at AHU, and Soyeon Kim- a SRNA of the 2021 cohort at AHU.

To maintain interest in this scholarly project, evidence-based recommendations were made to the DNAP program at AHU for the appropriate implementation of cognitive aids in nurse anesthesia simulation education at AHU and to COA.

Procedures

At AHU the course DNAP701 requires SRNAs to participate in high fidelity simulated learning in the DNAP simulation operating room. The students are assigned to small groups of approximately three SRNAs. These small groups are tasked with managing a specific anesthesia-related emergency. All students participated in a simulation scenario without a cognitive aid and then were voluntarily recruited to complete the GSE scale on Microsoft Forms. After completing the survey, the SRNAs were tasked with completing the same anesthesia-related emergency with the *Emergency Manual: Cognitive Aids for Perioperative Critical Events* available. At the conclusion of this second simulation exercise, the SRNAs again responded voluntarily to the GSE Scale. The student-specific responses from both surveys were compared and statistically analyzed to determine if the independent variable of the cognitive aid contributes to the self-efficacy of SRNAs in a statistically significant manner.

Implementations

After researching topics related to SRNA education, and performing a literature review, the subject of simulation learning with the use of a cognitive aid became of interest. Specifically, how the use of cognitive aids in simulated clinical scenarios affects SRNA perception of clinical preparedness. This topic of interest led to the development of two questions in PICOT format that were submitted to AHU faculty in May of 2020 for approval. Following approval, key players were identified and interviewed: Dr. Carolyn Ramsey (associate professor in the Nursing Department at AHU), Dr. Steven Fowler (faculty member of the DNAP program at AHU), and Soyeon Kim (SRNA of the 2021 cohort at AHU) in June of 2020. A PowerPoint outlining the proposed project design was submitted to Dr. Manuel Tolosa and Dr. Roy Lukman in June of 2020. The project team received feedback and modified the method design based on the recommendations from the reviewers.

In December of 2020, the scholarly project proposal was submitted to the Institutional Review Board (IRB). Following approval, plans to distribute the survey in February of 2021 were made with the course instructors of DNAP 701. After receiving the survey responses they were compiled to a Microsoft excel spreadsheet and stored on the secure platform. In April of 2021 plans to distribute the second survey were made with the course instructors. These additional responses were compiled on a Microsoft excel spreadsheet, and both survey responses were entered into SPSS software for analysis with the assistance of Dr. Lukman.

Barriers and Facilitators

A potential barrier of this scholarly project was the Covid-19 pandemic as it forced AHU to transition from in-person to online learning. This had the potential to alter the simulation learning schedule for the cohort of 2023. Substantial modifications to this scholarly project

would have been required if students were unable to attend simulation learning in Spring of 2021. Time limitation for both the scholarly project team and participants to partake in this project was also identified. This could be a prospective barrier because both scholarly project team members and participants are currently enrolled in a demanding DNAP program.

The facilitators to this scholarly project include both Dr. Steven Fowler and Dr. Manuel Tolosa, as they were the course instructors for DNAP 701, and were essential to the success of this project. Additionally, the simulation coordinators at AHU, and the statistician were both be essential for the facilitation of this project. The stakeholders of this project include the AHU faculty members, program director, future SRNAs, and COA.

Procedures to Sustain

If this scholarly project determines a statistically significant relationship exists between the use of cognitive aids in simulation learning and SRNA's perception of clinical preparedness, this will be shared with AHU DNAP faculty and COA. In order to sustain the proposed intervention, new-found evidence-based recommendations will be made to enhance simulation learning in nurse anesthesia education.

Anticipated Limitations

There were multiple anticipated limitations that have been identified for this scholarly project. One limitation noted is the small convenience sample size of approximately thirty participants. The small sample size could lack a statically significant result due to the potential wide confidence interval. An additional limitation is the lack of comparison among SRNAs that attend different anesthesia programs. Although the GSE Scale is a validated tool, the modifications to the survey are not and could represent a limitation. The voluntary nature of the survey responses could create bias because participants are also members of the DNAP program

and understand the need to complete the scholarly project. The fact that the chair of this scholarly project, teaches the course DNAP 701 and stands to benefit from knowledge gained from these results is noted as a potential bias. It should also be noted that the study's design does not determine if improved clinical preparedness is related to repeated simulation or the use of a cognitive aid.

Timeline

After researching topics related to the profession of anesthesia, two questions in PICOT format were developed and submitted to AHU faculty in May of 2020 for approval. After approval of the topic, these questions guided a literature review and identification of key players to be interviewed, both completed in June of 2020. Dr. Carolyn Ramsey (associate professor in the Nursing Department at AHU), Dr. Steven Fowler (faculty member of the DNAP program at AHU), and Soyeon Kim (SRNA of the 2021 cohort at AHU) were the key players that were interviewed. A PowerPoint outlining the proposed scholarly project design was submitted to Dr. Manuel Tolosa and Dr. Roy Lukman in June of 2020.

In December of 2020, the scholarly project team submitted to the IRB. Following approval, plans to distribute the survey in February of 2021 were made with the course instructors of DNAP 701. After receiving survey responses they were compiled in a Microsoft excel spreadsheet and stored on the secure platform. In April of 2021 plans to distribute the second survey were made with the course instructors. These additional responses were compiled in a Microsoft excel spreadsheet, and both the survey responses were analyzed by utilizing SPSS software with the assistance of Dr. Lukman.

Results

At the time of implementation there were twenty-eight members of the DNAP cohort of 2023 that were eligible to participate in this scholarly project. Twenty-one pretest surveys were completed, and fifteen post-test surveys were completed. Six participants that completed a pretest failed to complete a posttest and therefore were excluded. Fifteen participants were included in this project for the final data analysis.

Analysis of the data was performed using SPSS software (version 21.0, SPSS Inc, Chicago, Illinois). Correlation statistics were used to test the hypothesis set at the level of significance $< .05$. A Paired Samples Test was performed to compare the individual participants' pre- and post-test GSE survey result.

Demographics

Participants in the study are students that were taking DNAP 701 at AHU at the time of implementation in the Spring of 2021. No other demographic data was collected on the participants of this project.

Quantitative

A dependent t-test was performed using SPSS software version 21.0. Pretest mean values increased from 29.4 to posttest mean values of 32.07. The obtained t value is -2.751 ($p = .016$).

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PreTest	29.4000	15	3.92428	1.01325
	PostTest	32.0667	15	4.93481	1.27416

Table 1. Paired Samples Statistics

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 PreTest - PostTest	-2.66667	3.75436	.96937	-4.74576	-.58757	-2.751	14	.016

Table 2. Paired Samples Test

Discussion & Implication

The scholarly projected team sought to determine if the use of cognitive aids in simulation learning improved SRNA's perception of clinical preparedness. As required by COA, SRNAs participate in clinical simulation learning scenarios during their education. These simulated experiences may be completed with or without the use of a cognitive aid. Prior to this scholarly project, cognitive aids were used in DNAP 701 at AHU but SRNA perception of clinical preparedness after using cognitive aids in simulation learning had not been assessed. Therefore, the primary aim of this scholarly project was to determine if the use of cognitive aids during clinical simulation had a statistically significant impact on AHU DNAP cohort 2023 perception of clinical preparedness. The objectives were to determine the AHU DNAP cohort 2023 perception of clinical preparedness before and after the implementation of cognitive aids in a simulated scenario and provide evidence-based recommendations.

Prior to implementing this scholarly project, a review of the literature pointed to evidence that SRNA's perception of clinical preparedness is affected using cognitive aids in clinical simulation. In alignment with the available literature, the results from this scholarly project provide additional support that SRNA's perception of clinical preparedness is increased using cognitive aids in simulation learning. This insight benefits healthcare by potentially increasing the perception of clinical preparedness of future CRNAs. This project inspires the need for

additional research in the correlation between perception of clinical preparedness and real-world clinical preparedness.

After implementation of this scholarly project, the data was collected, analyzed and statistical significance was achieved. Therefore, it can be concluded that the use of cognitive aids during an anesthesia-related simulated scenario significantly increased participants' perception of clinical preparedness as measured by the GSE.

Previous research has concluded that cognitive aids used in simulation learning improved perceptions of preparedness and self-efficacy as compared with simulation experiences without cognitive aids (Gangadharan, 2018; Gardner, 2018; Martin, 2017; Tujague, 2019). The results of this scholarly project provide further support that participants, specifically SRNAs, have increased perceptions of clinical preparedness when a cognitive aid is used in simulation learning. The evidence above points to a correlation between the use of cognitive aids in simulation learning and perception of clinical preparedness, this scholarly project is able to support recommendations for their use in the education of SRNAs specifically. The results of this project provide evidence for AHU DNAP department use of cognitive aids in simulation learning in DNAP 701.

Bandura's Social Cognitive Theory of Self-efficacy was utilized as the theoretical framework for this scholarly project. This theoretic framework supports the notion that individuals perform superiorly in difficult situations if they have a high self-perception of efficacy. When SRNAs participated in simulation learning during DNAP 701 with the use of a cognitive aid compared to without a cognitive aid reported improved self-efficacy scores as measured by the GSE.

These improved self-efficacy scores benefit nurse anesthesia education and practice by increasing perception of preparedness of SRNAs. AHU DNAP course 701 is in alignment with the evidence-based practice recommendations based on the findings of this scholarly project. It can be theorized that SRNAs who perceive themselves as clinically prepared will perform better in real world practice but further research to investigate this is warranted.

As required by COA, DNAP programs must incorporate simulated clinical experiences into the curriculum (COA, 2020). As it stands, these simulated experiences may be completed with or without the use of a cognitive aid. However, the results of this scholarly project support COA modifying its' current requirements to include the use of cognitive aids in simulation.

Limitations

This project faced multiple limitations. The project was limited to a small convenience sample size of twenty-eight eligible participants and only fifteen were included in the final data analysis. This small sample size has the potential to present a false positive result because of its impact on the *p*-value. The utilization of a single sample site to gather data limits the ability to apply these findings to other anesthesia education institutions. The GSE is a verified evaluation tool of self-efficacy, but perhaps the use of a tool that specifically evaluates clinical preparedness, had it existed, could have yielded more specific results.

Conclusion

Simulation learning is utilized by all anesthesia education institutions to practice procedures, enhance situational awareness, hone critical thinking skills, and develop crisis management skills. This controlled environment allows students to practice while ensuring complete patient safety (Wunder, 2016, Council on Accreditation of Nurse Anesthesia Educational Programs, 2020). The purpose of this scholarly project was to evaluate the

perception of clinical preparedness among SRNAs participating in simulation education using a cognitive aid at AHU. This scholarly project found that a positive statistically significant correlation exists between these two variables. These findings allow for evidence based recommendations to be made to key stakeholders to include cognitive aid use in simulation learning in SRNA education.

Dissemination Plan

A preliminary PowerPoint presentation was created and presented over a video teleconferencing software due to COVID-19 to institutional key members and DNAP colleagues. The dissemination of this project will take place in the Spring of 2022 at AdventHealth University located in Orlando, Florida. A poster presentation will be given to relevant committee members of AHU in the Spring of 2022. The scholarly project will be placed in AHU library archives and made accessible for students' and faculty viewing.

Budget/Grant

This scholarly project does not require a grant or budget proposal.

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Appendix A

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Clebone, A., Watkins, S. C., & Tung, A. (2020). The timing of cognitive aid access during simulated pediatric intraoperative critical events. <i>Pediatric Anesthesia</i>					
Purpose	Variables	Setting/Subjects	Measurement and Instruments	Results	Evidence Quality
<p>Study One: To test the added benefit of having a visual aid in successfully managing a moderate to severity contrast medium reaction during a simulation.</p> <p>Study Two: To see when a cognitive aid is utilized during simulated pediatric intraoperative critical events by anesthesia personal.</p>	<p>Study One: Primary outcome: Access to a visual aid would decrease time to administer IM epinephrine and/or lower management errors. Secondary outcome: Participants perceived benefit from having a visual aid.</p> <p>Study Two: Primary outcome: Percentage of simulations in which the cognitive aid was accessed after at least one key behavior had already been performed. Secondary outcomes: Based on scenario type, when was the time to first cognitive aid use and number of key behaviors performed.</p>	<p>Study One Setting: Department of Radiology and Biomedical Imaging at Yale-New Haven Hospital Simulated event</p> <p>Subjects: Radiology fellows, radiology, residents, radiology mid-level providers, radiology nurses, and attending diagnostic radiologist. 138 total</p> <p>Study Two: Setting: Simulated Operating Room during a pediatric critical event.</p> <p>Subjects: 89 anesthesia caregivers. 44 Anesthesia Residence and 45 Student Registered Nurse Anesthetist (SRNA)</p>	<p>Study One: Mean time to IM epinephrine administration (t-test). Medication Errors that occurred during simulation (Fisher exact test, significant with <i>p</i> value of < 0.05) Survey with Likert Scale rating Gauging Perceived Benefit of Visual Aid (Wilcoxon Signed Rank test)</p> <p>Study Two: Time that the event was recognized. Time of first cognitive aid used. Time of performance of each key behavior included in the cognitive aid</p>	<p>Study One: Mean time: 97 seconds with aid and 152 seconds w/o aid. Proportion of errors: 28.6% made errors (4 w/o aid, 2 with aid) Survey: 55.8% very comfortable or comfortable; 44.2% uncomfortable or very uncomfortable with management of reaction. Verses 93.5% very comfortable or comfortable and 6.5% uncomfortable or very uncomfortable without aid.</p> <p>Study Two: Time to accessing cognitive aid differed significantly depending on the scenario. (P=0.03) 95% key behavior performed prior to cognitive aid use.</p> <p>Implications</p> <p>Study One: The visual aid use gave higher subjective confidence of participants in contrast medium reaction management. Study Two: The design of critical event cognitive aids should consider the type of critical event being addressed, how familiar the practitioner is with event, and whether the tool is likely to be used for support, key pieces of information, or both.</p>	<p>Study One Methodological flaws: Lack of blinding, Single institute study, small sample size Inconsistency: none Indirectness: Multidisciplinary study Imprecision: None Publication bias: None</p> <p>Study Two Methodological flaws: Retrospective analysis, lack of real-world data Inconsistency: None Indirectness: None Imprecision: None Publication bias: None</p>
Design	<p>Study One Cohort Study (Prospective Observational for Quality Improvement)</p> <p>Study Two Retrospective analysis of a Cohort Study</p>				

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Gleich, S. J., Pearson, A. C. S., Lindeen, K. C., Hofer, R. E., Gilkey, G. D., Borst, L. F., . . . Martin, D. P. (2019). Emergency manual implementation in a large academic anesthesia practice: Strategy and improvement in performance on critical steps. <i>Anesthesia & Analgesia</i> , 128(2), 335-341.					
Purpose	Variables	Setting/Subjects	Measurement and Instruments	Results	Evidence Quality
<p>Study One: Explore iproviders' perception and attitudes in caring for critical ill infants and children in Pediatric Emergency Departments (PED) and General Emergency Departments (GED)</p> <p>Study Two: To establish how to successfully implement an Emergency Manual (EM) into a large academic anesthesia practice and assess the extent of integration and performance with the EM</p>	<p>Study One: Primary outcome: Qualitatively exam the perception of emergency department providers caring for critically ill infants and children.</p> <p>Study Two: Primary outcome: The implementation of an EM into a large academic anesthesia Secondary outcome: Examine the utilization of the new EM</p>	<p>Study One: Setting: 188 simulation debriefings in 24 ED Subjects: PED and GED providers of mixed professional role. Groups of providers including physicians, nurses, certified nursing assistants or emergency medical technicians, pharmacists, and respiratory therapist.</p> <p>Study Two: Setting: Mayo Clinic (Rochester, MN) Subjects: Physician anesthesiology, resident physicians, certified registered nurse anesthetist (CRNA), and student registered nurse anesthetist(SRNA). Preimplantation: 59, post implantation: 60</p>	<p>Study One: A scripted debriefings was held, using open ended question, conducted by a single facilitator with experience in qualitative interviewing, at the conclusion of a simulated pediatric case.</p> <p>Study Two: Effective implementation as evident by the use of the EM after 6 months of institutional roll out. Verbal simulation crisis event survey study using preimplantation and post implantation (6 months) evaluation. One of three verbal simulation by peer to peer reading was delivered and a 60 second evaluation period was provided for the participant to state critical steps that were preidentified.</p>	<p>Study One: Overall GED team discomfort with critically ill children but relatively greater comfort with algorithm-based care. GED teams uses cognitive aids more. GED discomfort with pediatric-specific equipment and medications. PED uses the multidisciplinary team more.</p> <p>Study Two: Full integration of the EM was not achieved in 6 months. EM introduction: create a standardize location, multimodal communication, quick tabs, and water resistance paper. Critical steps verbalized Pre-16(53.3%), Post- 19.5(64%), 25/60 used EM and greater performance among those who used the EM.</p>	<p>Study One: Methodological flaws: Recruitment bias Inconsistency: Selection bias Indirectness: Gives little evidence to guide practice. Imprecision: Simulated feelings, not actual feelings. Publication bias: None</p> <p>Study Two Methodological flaws: Convivence sampling, lack of control group, and lack of blinding. Inconsistency: Different subject for pre and post implementation phases. Indirectness: None Imprecision: Small sample size Publication bias: None</p>
Design					
<p>Study One: Cross-sectional observational study</p> <p>Study Two Cohort Study</p>					
Implications					
<p>Study One: Analyzing PED and GED perception should guide education and improvement interventions.</p> <p>Study Two: Using a structured and vetted process to implement a EM in anesthesia practice may improve performance of providers in crisis situation.</p>					

References					
Storm, M. (2016). Emergency Manuals in Anesthesia Implementation of an Emergency Manual at a Level 1 Trauma Center as a Pilot Project (Doctoral dissertation, Missouri State University).					
Tujague, L. C. (2019). Effects of Cognitive Aids during High-Fidelity Simulation on Srna Self-Efficacy in the Management of Amniotic Fluid Embolism (Doctoral dissertation, Franciscan Missionaries of Our Lady University).					
Purpose	Variables	Setting/Subjects	Measurement and Instruments	Results	Evidence Quality
<p>Study One: Improve the awareness, interest, and knowledge for the use of emergency manual/cognitive aid/checklist (EM/CA/C) among the perioperative team.</p> <p>Study Two: To investigate the effect that cognitive aid (CA) use during high-fidelity simulation has on second-year student registered nurse anesthetist's (SRNAs) self-efficacy.</p>	<p>Study One: Primary outcome: Awareness, interest, and knowledge of EM/CA/C Secondary outcome: Use of cognitive aid</p> <p>Study Two: Primary Outcome: Self-efficacy Secondary Outcome: Use of cognitive aid.</p>	<p>Study One: Subjects: perioperative anesthesia team managing crisis at level 1 trauma center including registered nurses (RN), certified registered nurse anesthetists (CRNA), physicians (MD), scrub techs (ST), and other technicians. Setting: level 1 trauma center</p> <p>Study Two: Subjects: 10 second-year students in nurse anesthesia program at a university in the southern United States Setting: Anesthesia simulation laboratory</p>	<p>Study One: Pre-implementation survey, post implementation survey</p> <p>Study Two: Pre-simulation general self-efficacy scale (GSE) survey to assess self-efficacy and post-simulation GSE score.</p>	<p>Study One: 110 pre-surveys completed. 69% total had knowledge of EM/CA/C. 40% have used EM/CA/C. 97% found use of EM/CA/C helpful (all 100% except RNs 93%) 135 post-surveys completed. 84% had knowledge of EM/CA/C. 74% have used EM/CA/C. 98% found EM/CA/C helpful.</p> <p>Study Two: Out of 100 responses, 94% of the CA group and 84% of the non-CA group selected moderately true or exactly true. CA group displayed higher mean scores r/t self-efficacy.</p>	<p>Study One: Methodological flaws: Voluntary response sample could create bias, some participants unfamiliar with wording of EM/CA/C so may have given feedback for tool not fully understood. Inconsistency: None Indirectness: None Imprecision: None Publication bias: None</p> <p>Study Two: Methodological flaws: Small sample size, convenient sampling, limited diversity of experience of SRNAs in sample Inconsistency: None Indirectness: None Imprecision: None Publication bias: None</p>
Design					Implications
<p>Study One: Cohort Study Study Two: Cohort Study</p>					<p>Study One: Implementing EM/CA/C tool improves interest, awareness, and knowledge in using such tools. Study Two: Applying CA to intraoperative crises, in simulation or practice, may generate a positive change towards self-efficacy in SRNAs</p>

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Purpose	Variables	Setting/Subjects	Measurement and Instruments	Results	Evidence Quality
<p>Study One: To determine if the use of simulated operating room experience with cognitive aids was effective in increasing confidence levels of SRNAs in the recognition and treatment of malignant hyperthermia (MH).</p> <p>Study Two: To evaluate users preferences for a cognitive aid (CA) paper and electronic presentation formats, during management of simulated critical event.</p>	<p>Study One: Primary outcome: SRNA perceived confidence levels. Secondary outcome: MH simulation with use of CA, MH simulation without the use of CA.</p> <p>Study Two: Primary outcome: Perceived experience using different versions of the CA. Secondary outcomes: Simulation with paper CA, simulation with electronic CA, simulation without CA.</p>	<p>Study One Setting: OR simulation lab Subjects: SRNAs with no prior direct clinical experience with MH (14)</p> <p>Study Two: Setting: OR simulation lab Subjects: 89 subjects (44 anesthesiology residents (AR), 45 student registered nurse anesthetists)</p>	<p>Study One: Likert scale pre/posttest to assess preparedness to recognize and treat MH.</p> <p>Study Two: Anesthesia trainees simulated critical events under one of three randomized conditions: (1) memory alone, (2) paper version of the CA, or (3) electronic version of the CA. Participants were asked to complete survey about their experience using different versions of the CA.</p>	<p>Study One: Before simulation 1 SRNA chose level (L) 1-not confident, 4 L 2, and 2 L 3-somewhat confident. Control group after simulation; 1 L 2, and 6 L 3. CA group before simulation; 4 L 1, 1 L 2, 2 L 3; after simulation 3 L 2, 4 L 3.</p> <p>Study Two: Overall respondents (67 of 89): paper 39 (58%), electronic 24 (35%), neither 4 (5%) SRNAs (39 of 89): paper 24 (62%), electronic 13 (54%), neither 2 (50%), ARs (28 of 89): paper 15 (39%), electronic 11 (46%), neither 2 (50%)</p>	<p>Study One: Methodological flaws: Very small cohort of subjects. Inconsistency: None Indirectness: none Imprecision: None Publication bias: none</p> <p>Study Two: Methodological flaws: Because of randomization, not all participants used both CAs; cannot offer a true direct comparison.. Inconsistency: None Indirectness: None Imprecision: None Publication bias: None</p>
Design					
<p>Study One: Cohort study (pre/posttest comparing outcomes of two cohorts)</p> <p>Study Two: Cohort Study</p>					
				Implications	
				<p>Study One: CA improved confidence.</p> <p>Study Two: Overall 58% prefer paper CAs, 35% prefer electronic CAs, 5% prefer neither. SRNAs prefer paper CAs (62%) while ARs prefer electronic CAs (46%)</p>	

References					
Mazer, L. M., Mazer, L. M., Storage, T., Storage, T., Bereknyei, S., Bereknyei, S., . . . Skeff, K. (2017). A pilot study of the chronology of present illness: Restructuring the HPI to improve physician cognition and communication. <i>Journal of General Internal Medicine</i> , 32(2), 182-188.					
St Pierre, M., Breuer, G., Strembski, D., Schmitt, C., & Luetcke, B. (2017). Does an electronic cognitive aid have an effect on the management of severe gynecological TURP syndrome? A prospective, randomized simulation study. <i>BMC Anesthesiology</i> , 17(1), 72-10.					
Purpose	Variables	Setting/Subjects	Measurement and Instruments	Results	Evidence Quality
<p>Study One: To determine the feasibility and impact of the Chronology of Present Illness (CPI) on the patient interview, written notes, and communication with other providers.</p> <p>Study Two: To investigate the effectiveness of a Cognitive Aid (CA) in management of a newly changed practice guideline for transurethral resection of the prostate (TURP) syndrome and assess the providers' perception of using a CA.</p>	<p>Study One: Primary outcome: Efficiency, quality, and clarity of patient interaction.</p> <p>Secondary outcomes: The use of the CPI cognitive aid template</p> <p>Study Two: Primary outcome: Compare the management of severe gynecological TURP syndrome with an electronic CA versus memory alone.</p> <p>Secondary outcome: Determine the participants' perception of the clinical relevance and usefulness of a CA.</p>	<p>Study One: Setting: Hospital nightshift rotation (11/14/2015-2/19/2016) Subjects: 22 internal medicine residents Post Graduate Year (PGY)-2 & 3.</p> <p>Study Two: Setting: Simulated scenario of an intraoperative emergency of severe gynecological TURP syndrome. Subjects: 17 teams of anesthetic nurses (17), anesthetic trainees (20) and consultants anesthesiologist (17).</p>	<p>Study One: Retrospective pre-post surveys on efficiency, quality, and clarity of patient interaction, written note, and verbal handoff using Likert scale, and open-ended comment.</p> <p>Study Two: 8 evidence-based practice (EBP) metrics of essential care evaluated in a binary fashion. A Fisher's exact test used to compare results. Then a six-item survey was given with binary answers. The chi-squared test was applied to analyze surveys.</p>	<p>Study One: Residents: pre-CPI efficiency of sign out: 3.84, post: 4.24 (p 0.008). pre-CPI quality of assessment and plan: 3.72, post: 4.05 (p 0.030). pre-CPI clarity of written note: 3.93, post 4.33 (p 0.006)</p> <p>Study Two: Treatment task without CA (pulmonary edema) 44.5% vs. 97.5% with CA; (hyponatremia) 11% vs. 79%. Participants found the CA helpful but decline to vote the implementation of the CA into practice.</p>	<p>Study One: Methodological flaws: Voluntary responses could introduce social desirability bias, small sample Inconsistency: None Indirectness: None Imprecision: None Publication bias: None</p> <p>Study Two: Methodological flaws: Convenience sample, and risk of scoring bias. Inconsistency: None Indirectness: None Imprecision: small sample size, unvalidated survey Publication bias: None</p>
Design					
<p>Study One: Cohort Study Study Two: Randomized Control Trial</p>					
				Implications	
				<p>Study One: Implementing CPI tool improved workflow and patient satisfaction.</p> <p>Study Two: The CA improved the implementation of EBP in simulated intraop scenario and could help to close gap between guideline publication and implementation in acute patient care.</p>	

Appendix B

https://forms.office.com/Pages/ResponsePage.aspx?id=h1hMzhprKkCfiLtUBmIvUrba8QK0QTNBoPAm8r70_WRUNDIxQkRKWlpHM1g3SzhJRFIPQVNRSjhYWC4u



https://forms.office.com/Pages/ResponsePage.aspx?id=h1hMzhprKkCfiLtUBmIvUrba8QK0QTNBoPAm8r70_WRURjNMQzBUSFhESFoyWE9YM1o0RzdKU1hFOS4u



