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Effects of Debriefing Methods on the Development of Non-Technical Skills: An Evidence-Based Educational Module

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Effects of Debriefing Methods on the Development of Non-Technical Skills: An Evidence-Based Educational Module

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Abstract

Background

Simulation-based education is integral to Nurse Anesthesiology training. SBE cultivates effective clinical decision-making in dynamic environments and is conducive for non-technical skills (NTS) to flourish. The consequences of undeveloped NTS in the student registered nurse anesthetist (SRNA) have the potential for egregious and adverse outcomes. However, NTS is not routinely evaluated in nurse anesthesiology training programs. Quantifiable assessment tools can be used to ensure the satisfactory achievement of NTS. Evidence supports using the Anesthesia Non-Technical Skills (ANTS) checklist to evaluate and develop NTS in anesthesia providers during their training curriculums. This capstone project aims to demonstrate the use of quantifiable assessment tools for developing NTS in the SRNA and seeks to bridge the gap between simulation and practice in developing effective non-technical skills in student registered nurse anesthetists.

Methods

A quasi-experimental pretest-posttest design was used to investigate the effect of an educational module on anesthesia provider awareness of quantifiable assessment tools to measure and develop non-technical skills to optimize clinical performance. An organizational assessment was performed, and an educational module was developed and disseminated among a small hospital in South Florida. using a computer survey intake platform, data was collected and analyzed.

Results

The data presented reflect a statistical analysis of the pretest and posttest questionnaires following implementation of the educational module. Identical knowledge-based questions were asked on the pretest and posttest to measure whether participants augmented their knowledge after the educational module. Significant statistical difference was noted in several categories on tht pretest to posttest questionnaires, which displayed an improved knowledge base. Additionally, increased awareness of NTS improved the perception of debriefing after simulation-based education, making its application readily available.

Discussion

The findings and insights gained from this successful quality improvement project can lead to improved development of NTS and enhanced patient care and safety. Simulation-based training in concurrence post-scenario debriefing is an excellent opportunity to apply the ANTS tool. Standardizing and validating assessment tools empower educators and preceptors to better prepare future nurse anesthetists. Timely utilization of quantifiable assessment tools is imperative for developing NTS in the SRNA. The limitations of the quality improvement project included the small sample size, virtual implementation of educational module, and attrition. A quality improvement project of this magnitude can be used to elicit practice change in both the clinical setting and the education arena. The development of NTS in SRNAs leads to an enriched knowledge base and improved skill sets, thus improving forthcoming clinical performance and optimizing patient care.

Keywords: *non-technical skill, situational awareness, simulation-based education, debriefing, student registered nurse anesthetist.*

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I. Introduction

Background

Healthcare professionals, specifically anesthesia providers, are trained through various modalities to ensure adequate competency and preparedness. In the clinical practice of anesthesia, non-technical skills hold substantial importance in ensuring patient safety. Patient safety is a primary concern when developing the skill set of an anesthesia provider. In addition, clinical decisions must be made quickly and effectively in dynamic environments such as the operating room. The use of simulation-based education in nurse anesthesiology training programs provides a conducive environment for developing non-technical skills.[1] Furthermore, simulation-based training has been found to positively impact the recognition of errors, enriching the value of self-confidence and playing a central role in developing behavioral skills.[2] The significance of undeveloped non-technical skills in the nurse anesthetist has the potential for egregious and adverse patient outcomes.[1,2] Therefore, developing non-technical skills throughout the education of nurse anesthesiology students is central to endorsing competent anesthesia providers and patient safety. The clinical inquiry explored in this manuscript was as follows: In the student registered nurse anesthetist undergoing anesthesiology academic training, how do quantifiable assessment tools during debriefing compare to verbal-only debriefing aid in empirically evaluating and developing non-technical skills?

Problem Identification

Non-technical skills encompass a wide range of competencies that go beyond the purely technical aspects of anesthesia administration. Anesthesia providers, such as certified registered nurse anesthetists (CRNAs), are trained in the necessary skills to provide safe anesthetic care. In the United States, there are approximately 130 accredited nurse anesthesiology programs, and

these training programs typically take 24 to 51 months to complete.[3] Academic training programs are tasked with ensuring that technical skills and non-technical skills (NTS) are attained by the trainee or student registered nurse anesthetist (SRNA). However, NTS are not routinely evaluated in nurse anesthesiology training programs.[1] The lapse of NTS assessment in nurse anesthesiology training programs represents a notable gap in the overall preparation of anesthesia providers.

Most healthcare errors are attributed to 80% of human error by the unawareness of NTS by the healthcare provider.[1,2] The majority of errors in healthcare are directly related to the failed execution of NTS during the perioperative period.[2] In the perioperative setting, unfavorable events can occur to the anesthetized patient undergoing surgical procedures. These adverse events may encompass a wide range of situations, from anesthesia-related complications to surgical complications and unforeseen emergencies. Unfavorable surgical occurrences account for 30% of hospital admissions.[4] Anesthesia providers with well-developed NTS can abate these statistics to ensure optimal anesthetic care and improved patient safety.[2,4] The primary concern is ensuring the safety and well-being of patients during this critical phase of care.

Understanding and enhancing the human factor of NTS are paramount in achieving safer anesthetic practices. The performance and behavior skills of the individual are the human factors that constitute NTS, which are essential for delivering safe and efficient anesthesia.[5,6] Anesthesia providers must possess technical expertise and cultivate skills such as effective communication, situational awareness, teamwork, and adaptability. Focusing on this human component of NTS is necessary to address the problem. The prevention and mitigation of these unfavorable events depend not only on the technical skills of the anesthesia providers but also on their NTS, which play a crucial role in responding to unexpected circumstances with poise and precision.

Recognizing the significance of NTS and its integration into foundational education is essential in enhancing patient safety and optimizing the overall quality of anesthesia care.

Scope of Problem

Healthcare providers, including CRNAs and SRNAs, occupy critical roles as indispensable members of the healthcare team entrusted with the delivery of perioperative anesthesia services. Their roles encompass a continuum of responsibilities crucial to safeguarding the well-being of patients throughout the surgical process. In anesthesia practice, NTS play a significant function in patient safety, yet they are not formally integrated into the curriculum of nurse anesthesiology training programs.[1,4] Thus, developing NTS early in the foundational training for anesthesia students is necessary. NTS can be classified as an individual framework and as a collaborative framework. The 4 core categories of NTS are decision-making, situation awareness, task management, and teamwork.[1,4] Situation awareness and decision-making are cognitive skills related to the individual aspect of NTS.[2] Task management and teamwork are social and interpersonal skills related to NTS' collaborative team aspect.[2] The scope of the problem entails addressing both the individual and team aspects of NTS.

Technical skills can be directly measured using well-established assessment tools, such as a key action scoring system.[1] On the other hand, NTS are less routinely assessed during stimulation-based training.[1,4] Technical skills can be defined as the ability to recall information and carry out necessary diagnostic and therapeutic interventions.[7] NTS can be defined as "cognitive, social, and personal resource skills" that accompany technical skills to deliver safe anesthesia care.[4,8] NTS profoundly impacts an individual's performance and is associated with excellence in delivering anesthesia care.[4]

The appropriate development of NTS can potentially enhance situation awareness and decision-making for SRNAs. Nevertheless, the assessment and acquisition of NTS remain non-standardized in nurse anesthesiology training.[1,4,6] Simulation-based training and effective debriefing have proven effective in developing situation awareness and other NTS, ultimately leading to the optimization of patient care.[8.] To address the existing gap in evaluating NTS among nurse anesthesiology trainees, incorporating formal debriefing sessions and objective assessment tools can mitigate this deficit and ensure the advantageous acquisition of NTS.

Numerous tools are employed to assess various aspects of clinical competence. The majority of assessment tools used in healthcare primarily focus on evaluating technical skills, leaving the critical aspects of behavior and attitudes unassessed.[8] In fact, the behavior and attitudes of the individual being assessed are fundamental components of NTS.[8.] To ensure the comprehensive development of NTS among SRNAs, quantifiable assessment tools and effective debriefing processes are essential. This review highlights using an evidence-based tool for evaluating NTS during debriefing, known as the Anesthesia Non-Technical Skills (ANTS) checklist. The ANTS checklist is an instrument that educators and preceptors can use in assessing NTS.[4]

The ANTS checklist introduces structure to the debriefing process using a 4-point scoring system to assess the 4 domains of NST discussed earlier: decision-making, situation awareness, task management, and teamwork.[4] Each category has a minimum score of 4 and a maximum score of 16, with a score of 1 indicating poor performance and a score of 4 indicating good performance.[4] Evidence supports the use of the ANTS checklist as a tool to effectively evaluate and develop NTS among nurse anesthesia providers during their training programs.[1,2,4,8,9]

Consequences of the Problem

Safety is a significant concern when patients undergo surgical procedures under anesthesia. The complexity of the surgery, coupled with the patient's comorbidities, intensifies the anesthetic plan for that procedure. Within the context of anesthesia delivery, anesthesia providers must be able to think critically and make decisions on a moment-by-moment basis. Notably, the deficiency in non-technical skills (NTS) has consistently been linked to significant errors and adverse patient outcomes in the perioperative period.[2] NTS plays a pivotal role in enhancing the safety and efficiency of healthcare teams, thus reducing errors and improving patient safety. The consequences for underdeveloped NTS can lead to serious patient harm and is a prominent source of adverse events within healthcare.[10]

The financial implications of medical errors in healthcare are noteworthy. Mistakes in the clinical setting can lead to extended hospital stays and unfavorable patient outcomes. Annual healthcare expenses range from billions to trillion dollars in the United States.[11] Medical errors contribute to an estimated increase of 45% in healthcare costs.[11] Additionally, a considerable number of preventable mortalities occur each year, often stemming from miscommunication and improper management of a situation.[12] Addressing the unacceptable consequences of a significant rise in healthcare costs and adverse patient events is imperative.

According to experts, improving the development of NTS in healthcare providers can effectively reduce medical errors and, subsequently, enhance patient safety.[10] Furthermore, simulation-based education has been shown to improve the clinical performance and the proficiency of healthcare providers and their respective collaborative teams.[12] Given the extraordinary cost associated with adverse medical errors, investing in educational programs that integrate the development and assessment of NTS into their curriculums is justifiable.

Knowledge Gap

Considerable efforts have been dedicated to enhancing patient safety, particularly since the Institute of Medicine (IOM) released *To Err is Human* in 1999, recognizing the inevitability of errors and the need to mitigate them.[1,10] While significant acknowledgment exists that mistakes are inevitable, the burden to reduce them is imperative. Substantial research has been conducted on educating medical professionals about technical skills, but a noticeable gap remains in quantifying the acquisition of NTS. Different education modalities such as simulation-based training, key action checklists, anesthetists' non-technical skills framework, and effective debriefing have demonstrated their potential in addressing an individual's development of NTS and improving overall performance.[1,4,8]

Proposal Solution

Simulation-based training offers numerous advantages for SRNAs. One of these benefits includes allowing the SRNA to acquire critical skills necessary for providing safe anesthetic care. However, the actual benefits of simulation-based training can be seen through the deliberate practice of debriefing after a simulation.[13] Debriefing is an essential part of simulation-based training that enriches the knowledge and skills of the SRNA, ultimately leading to improved clinical performance and enhancing patient outcomes.[14] This in-depth and sustained understanding of NTS is achieved by fostering an environment that encourages reflection and constructive criticism during debriefing.[13] Debriefing can provide opportunities to identify performance gaps and serve as a means to improve clinical performance.[13]

The author conducted a systematic literature review to assess the various methods used in evaluating the performance and development of NTS following a high-fidelity simulation. This review included systematic reviews, experimental behavioral marker methods, as well as

longitudinal and quasi-experimental designs. Among the various debriefing strategies analyzed, approaches like video-facilitated debriefing, verbal-only debriefing, objective structured clinical examination (OSCE), and the utilization of a key action checklist (KAC), emerged as the recognized "gold standards" for debriefing and developing NTS.[1,8,13,14] It is evident that standardizing and validating tools to evaluate the performance and behaviors of SRNAs is paramount for the success of their education and ensuring optimal patient safety.[8] Quantifiable assessment tools not only allow for the identification of performance gaps but also serve as a valuable means to enhance overall performance. This doctoral project was designed to showcase the application of quantifiable assessment tools in developing NTS among nurse anesthetist trainees.

II. Literature Review

Eligibility Criteria

The goal of this literature review was to investigate the relationship between simulation-based education and debriefing methods. The literature review surveyed several research articles following an extensive criterion for eligibility. Inclusion and exclusion considerations were based on criteria derived from the Polit-Beck evidence hierarchy[15] and Johns Hopkins evidence and quality guide.[16] The search results were limited by publication date, population, language, and research design. Reference lists were examined to ascertain relevant articles. Inclusion criteria included: English language; non-technical skills were assessed for a professional medical trainee (student nurse anesthetist or medical resident); a debriefing tool was used; the research design (qualitative or quantitative) was performed between 2015 and 2022; and all the studies contained the following outcome: quantifiable debriefing tool that showed improvement of NTS

in trainees. In addition, the researcher appraised abstracts and titles to eliminate unrelated studies that did not address the clinical inquiry.

Informational Sources

The library services at Florida International University (FIU) were used to facilitate access to various database sources for conducting the literature search. The following databases were used to perform a literature search: Excerpta Medical Database (EMBASE), PubMed electronic database, and Cumulative Index of Nursing and Allied Health Literature (CINAHL). The abovementioned criterion was applied to narrow the selection of articles for eligibility.

Search Strategy

Through a preliminary search, the researcher identified 936 articles: articles from Medline (*n* = 485), PubMed (*n* = 315), and CINAHL (*n* = 136). After duplications were removed, *n* = 112 were assessed for significance based on abstract and title, eliminating *n* = 91 articles. Studies where full text was unavailable were also excluded, resulting in *n* = 21 remaining. Additionally, *n* = 11 articles were excluded for level IV-VIII evidence. The remaining *n* = 10 articles were included in this literature review.

Keywords

Keywords and Boolean operators were used in the literature review. The key terms included: *non-technical skill* OR *situational awareness* AND *high-fidelity simulation* OR *simulation-based education* AND *debrief** AND *crisis resource management* AND *anes** OR *student registered nurse anesthetist* OR *SRNA.* Boolean operators "AND" or "OR" were used.

Study Characteristics

The evidence gathered for the clinical inquiry included 5 quasi-experimental studies[1,4,17-19], 2 longitudinal studies[8,20], 2 systematic reviews[13,21], and 1 focused qualitative group study

design[9]. Two central themes were observed from the review of the articles. The first theme observed among the articles was medical trainees in a simulation-based training setting. The second theme included quantifiable debriefing tools that were utilized to improve NTS in medical trainees, including but not limited to anesthesia providers.

Results

The articles analyzed in this literature review revealed numerous findings. The literature review examined articles that assessed measurable debriefing tools, demonstrating enhancements in NTS among medical trainees—10 studies included in the literature review.

Wunder[1] used a quasi-experimental study with a pretest-posttest design. The variables measured included an educational intervention and the attainment of non-technical skills with the sample size $N = 32$.[1] Wunder analyzed the pretest and post-test data, identifying the significance between a key action scoring system and Anesthetists' Non-Technical Skills (ANTS) system.[1] The finding from the study showed the NTS post-test mean to be greater than the pretest scores: $T\ (df = 31) = 1.99$, $P = .028$.[1] The mean gained in the scores for standardized non-technical skills were significantly greater than those for standardized technical skills: $T\ (df = 30) = 1.81$, $P = 0.04$.[1] The appraisal of this study was given by the author a level of evidence of Level III. In conclusion, this study demonstrated that NTS are not acquired through experience but through instruction.[1] A 3-hour educational intervention on non-technical skills resulted in significant improvement of NTS.[1]

Flynn et al.[4] aimed to analyze the reliability of Nurse Anaesthetists' Non-Technical Skills-Norway (NANTS-no) and explore the development of NTS in student nurse anesthetists. The NANTS-no is a specially adapted behavioral marker system for nurse anesthetists in Norway.[4] This study used a quasi-experimental design with pretest and post-test questionnaires.[4]

The sample size $N = 14$, and the variables measured included a 10-week training course and the behavioral markers assessment tool, NANTS-no.[4] The NANTS-no demonstrated high overall inter-rater reliability ($ICC = 0.91$), high test-retest reliability ($ICC = 0.94$), and good internal consistency (Cronbach's $\alpha = 0.85 - 0.92$).[4] The appraisal of this study was given by the author a level of evidence of Level III. In conclusion, the NANTS-no showed significant improvement across all categories of NTS and is suitable for assessing NTS during simulation training in nurse anesthesiology educational programs.[4]

Flynn[8] used a longitudinal design with linear mixed-effect models to estimate the development of NTS over time. The primary goal of this study was to investigate how NANTS-no permits a systematic development and assessment of non-technical skills in clinical practice.[8] The NTS of N = 20 student nurse anesthetists were assessed at 3 time points over 12 months.[8] The variables measured included a structural assessment instrument and the NTS skills developed in clinical practice.[8] A 5-point rating scale was used for data analysis.[8] The finding from the study demonstrated an overall development of NTS ($P < .001$) in the student nurse anesthetists.[8] The adjusted $R^2 = 0.7$, indicating that 70% of the expected variation in the scores were explained by the progression of time (63%) and differences between the raters (7%).[8] Thus, 30% of the variation was due to other unmeasured factors.[8] The appraisal of this study was given by the author a level of evidence of Level II. In conclusion, the structured behavioral assessment tool, NANTS-no, demonstrated reliability for assessing NTS in clinical practice and significantly improved all categories of NTS during nurse anesthesia education.[8]

Garden et al.[13] is a systematic review that analyzed $N = 8$ empirical studies where elements of debriefing were methodically manipulated during NTS training in healthcare. The variables measured included analyses of different debriefing methods and the improvement in

non-technical skills performance.[13] The finding from the systematic review demonstrated a noticeable lack of empirical data regarding the specific nature of the debriefing process and NTS performance.[13] The systematic review's authors highlighted that a range of tools assist in quantifying debriefing to establish the relationship between the specific behaviors enacted by the debriefer and the subsequent changes in participant performance.[13] Due to the low sample size, the generalizability of this systematic review is poor. Therefore, the appraisal of this study was given by the author a level of evidence of Level II. In conclusion, debriefing practice should be evidence-based, as it is a critical component of training and should be performed by a skilled instructor.[13]

Sá-Couto et al.[20] is a longitudinal, double-blinded, randomized control study. The sample size was $N = 45$, and the variables measured included juxtaposition relationships between two groups, the feedback group and the debriefing group, along with the acquisition and retention of NTS.[20] Statistical analysis was conducted using statistical computer software. Mann-Whitney U test was used to compare the mean rank differences between the two groups for each day and each study variable.[20] A 5-point Likert scale was used to evaluate the post-discussion and preferred method of debriefing.[20] Results of this study demonstrated a mean increase (88.3%) in the overall objective scores for the debriefing group and a mean increase (82.6%) for the feedback group.[20] The Mann-Whitney U test ($p > 0.05$) showed no significant differences in the two group scores.[20] The appraisal of this study was given by the author a level of evidence of Level II. In conclusion, both groups showed to be equally beneficial in the acquisition and retention of NTS.[20] Debriefing may provide a safer educational environment, with participants deeply engaged in exploring and reflecting on their performances.[20]

Gourbault et al.[17] aimed to evaluate the validity and usability of the Medical Students' Non-Technical Skills (Medi-StuNTS) tool. This study evaluated questionnaire data using rudimentary descriptive statistics and a thematic analysis of qualitative data.[17] The sample size comprises $N = 4$ final-year medical students and $N = 9$ medical doctors with experience assessing medical trainees.[17] The variables measured included several simulations of common medical emergencies where the medical students assumed the leader and follower roles.[17] The questionnaire data consisted of completed surveys from medical students and the assessors.[17] The scores were evaluated with computerized statistical software for quantitative analysis.[17] A measure of inter-rater reliability was performed with a rWG analysis for each Medi-StuNTS skill element.[17] The inter-rater reliability score $rWG > 0.8$ indicates a high level of inter-rater agreement across all skill elements for a combined analysis of leaders and followers.[17] The inter-class correlation was performed on R studio.[17] The overall kappa score was 0.86 per simulation and 0.89 per skills element, indicating good ICC.[17] In addition, the P-values were all < 0.05.[17] Usability was assessed by mean observability, and the significance of this was assessed using an X^2 test.[17] Across all scenarios, an X^2 test showed that 0.5% of ratings showed no difference between using the Medi-StuNTS tool.[17] Overall skill observability increased from 72.40% to 82.14% between the first and last simulation.[17] Acceptability was assessed via an analysis of feedback.[17] The appraisal of this study was given by the author a level of evidence of Level III. In conclusion, The Medi-StuNTS tool has shown good usability, good internal structure, and significant beneficial consequences in assessing NTS during the simulation and delivering constructive criticism during post-simulation debriefing.[17]

Eismann et al.[18] investigated the reliability and effects of debriefing styles on medical students after anesthesia-based simulation training. This study aimed to enhance the team

performance aspect of NTS by providing an alternative method for debriefing, TeamGAINS (guided team self-correction, advocacy-inquiry, and systemic-constructivist techniques) debriefing.[18] The research design used a between-group pre-post survey methodology.[18] The sample size encompassed $N = 147$ senior level (4^{th} year) medical students.[18] The variables measured for this study included the anesthesia simulation courses, the medical debriefing group, and the TeamGAINS debriefing group.[18] The reliability was determined by Cronbach's α for all measurement points, was greater than 0.72.[18] Computerized analysis was used to conduct the Wilcoxon test to evaluate the questionnaire data collected for both groups before and after simulation.[18] The values were for medical debriefing group were MD = 0.19 ($p = 0.003$; $r = 0.25$) and the MD = 0.22 ($p = 0.01$; $r = 0.40$) for TeamGAINS debriefing.[18] The appraisal of this study was given by the author a level of evidence of Level II.[18] In conclusion, The TeamGAINS debriefing method increased trainees' psychological safety and leadership depth.[18] Simulation training paired with the TeamGAINS debriefing approach influences the attitude towards teamwork and helps to clarify the connection between individual performance and non-technical skills.[18]

Heaton et al.[19] evaluated the participants' perceptions using a pre-post questionnaire design. Facilitators were trained in crisis resource management to provide structured feedback, and high-fidelity simulations were used.[19] Participants ($N = 26$) were provided an educational intervention using a Delphi technique for the acquisition of NTS.[19] Using a 5-point Likert scale for the collection of data, questionnaires were disseminated before and after the simulation course to assess the understanding of NTS, validate the real-life scenario, apply relevance to the specialized training and predict the impact on future practice by improving NTS.[19] The author apprised this article as evidence of Level III. In conclusion, the participants of this study

exhibited an improved understanding of NTS performance, recognized its relevance to patient safety, and expressed a desire for its integration into training.[19]

Wood et al.[21] 2021 is a systematic review that analyzed *N* = 27 articles describing the development or validation of technical skills or NTS scoring systems. Among those empirical studies, *N* = 5 articles were identified as assessment tools for NTS.[21] The variables measured in this systematic review included the scoring system used, the simulation setting, the number of participants, the level of training at the time of assessment, and the validity and reliability status of each scoring system.[21] The correlation coefficient was used to cross-validate and demonstrate inter-rater reliability for the NTS scoring systems.[21] Most of the scoring systems included in the systematic review were applicable to technical skills.[21] The diverse nature of developing and validating these various scoring systems made statistical comparisons challenging.[21] The NTS scoring systems included in this study provided insight into the tools relative to developing NTS.[21] In conclusion, the multiple scoring systems identified for technical skills and NTS have been established and authenticated to satisfy educational requirements for various specialties; however, standardization and consistency are needed.[21]

Flynn et al.[9] used a qualitative descriptive study design to explore the experiences of nurse anesthetist students, clinical mentors, and clinical supervisors on the utilization of a structured behavioral assessment tool. The sample size included *N* = 12 student nurse anesthetists and *N* = 13 clinical mentors and supervisors.[9] Data was collected and analyzed using semi-structured interviews for qualitative content analysis.[9] The participants' experiences were described using the behavioral assessment instrument within the six categories.[9] Appropriately, several themes derived from the content analysis: promotion of excellent non-technical skills, promotion of cooperative learning, and promotion of organizational acceptance, ultimately

leading towards a path of clinical excellence.[9] The appraisal of this study was given by the author a level of evidence of Level III. In conclusion, increased awareness of NTS when using a structured behavioral assessment tool contributes to the competence of the nurse anesthetist role and mentoring process in nurse anesthesia educational programs.[9]

A Summary of Evidence Table can be found in Appendix A.

Discussion

Among the articles included in the literature review, the 5 qualitative studies used quasi-experimental research design studies utilizing pre-post survey methodology.[1,4,17-19]All 5 of the quasi-experimental studies[1,4,17-19] met Level III criteria for the level of evidence and were of good quality. Four of the quasi-experimental studies[1,4,17-19] provided an educational intervention and evaluated the participants' awareness of NTS before conducting a simulation and debriefing. The other quasi-experimental study[2] used a quantitative questionnaire before and after the simulation and computerized statistical analysis programs to provide quantitative data. Of the 2 longitudinal study designs, 1 was a double-blinded randomized control study[20], while the other used linear mixed-effect models.[8] Several structural assessment tools exist for evaluating NTS and were analyzed in a systematic review.[13] This systematic review had poor generalizability due to the low sample size. Still, it demonstrated that debriefing practices are a critical component of hands-on training and should be evidence-based when carried out.[13] Five scoring systems were identified in the second systematic review, where each scoring system was evaluated to assess their validity and reliability status.[21] Finally, the qualitative group study aimed to explore the experience of the participants, including SRNAs and clinical supervisors, using an instrument that evaluated NTS.[9] In conclusion, several organized assessment tools that shows potential in bridging the gap between simulation and practice in effectively developing NTS.

III. PICO Clinical Inquiry

Purpose

This clinical inquiry aims to develop an educational module that optimizes the performance and growth of non-technical skills in anesthesia providers, including SRNAs, in clinical settings. The goal is to inform providers on the application of quantifiable assessment tools and empower the use of the ANTS debriefing tool.

PICO Question

The clinical inquiry states:

> In the student registered nurse anesthetist undergoing anesthesiology academic training, how do quantifiable assessment tools during debriefing compare to verbal-only debriefing aid in empirically evaluating and developing non-technical skills?

The clinical inquiry can be further deconstructed using the PICO framework:

Population (P): Student Registered Nurse Anesthetist (SRNA)

Intervention (I): debriefing assessment tools

Comparison (C): verbal-only debriefing

Outcomes (O): improve the development of non-technical skills

IV. SMART Goals

Goals and Outcomes

Employing a SMART framework, the goals and outcomes of this project were developed using specific, measurable, achievable, relevant, and timely objectives. The primary purpose of this DNP project was to provide a pathway for educators, preceptors, and students to cultivate,

foster, and develop NTS. The ANTS evaluation tool[1] can successfully bridge the gap between the current methods in debriefing and effectively build NTS in SNRAs.

Specific

The education module enhanced awareness of NTS in both CRNAs and SRNAs, thus improving the student's successful learning experience and overall behavior performance in simulation and clinical settings. Simulation-based training in concurrence post-scenario debriefing is an excellent opportunity to apply ANTS.[1,2,4,8,9]

Measurable

The participants received a pre-questionnaire and post-questionnaire to assess comprehension and a paradigm shift in attitude towards the practice change. The pre-survey and post-survey were administered before and after the educational module presentation. The measured outcomes evaluated the participants' perceptions and attitudes towards NTS and the effectiveness of debriefing strategies pre-intervention and post-intervention.

Achievable

The educational module was delivered in person to the first-year cohort students in the Simulation Teaching and Research Center (STAR Center) at the Nicole Wertheim College of Nursing & Health Sciences at FIU. CRNAs and physician anesthesiologists (MDA) at a local hospital in South Florida were the targeted participants. In addition, the electronic questionnaire was available online to allow the participants to complete the pre-survey and post-survey.

Relevant

The educational module included current evidence-based practice in debriefing techniques and assessment tools for NTS. The module was delivered via a Microsoft PowerPoint

presentation. Anesthesia providers and students will benefit from the information presented to bring relevance to simulation-based scenarios and in situ clinical circumstances.

Time

The educational module was developed and implemented over 3 months. The pre-questionnaire was administered immediately before the educational module presentation. Sufficient time (14 days) was allotted for the participant to complete the post-questionnaire after the presentation of the educational module. The pretest and posttest will be administered electronically for organization and accessibility.

V. Conceptual Underpinning

Theoretical Framework

The theoretical framework of this project was based on a model for change. A theoretical framework is invaluable for implementing a structural shift and accepting organizational change.[22] Lippitt's Model of Change is the primary theoretical framework for implementing the educational module and embracing change for this quality improvement project. Lippitt's Model of Change is a seven-step model from Kurt Lewin's Theory of Change.[22] Lippitt's theory focuses on the leadership role in the change process with the addition of the change-agent part.[22] The seven steps include: (1) diagnosing the need for change, (2) assessing the motivation and capacity to change, (3) determining resources and clarifying the assessment for change, (4) establishing goals and a plan of action, (5) exploring alternatives, (6) implementing and maintaining the change, (7) generalizing/stabilizing the change and terminating the relationship of the change agent.[22] The concluding phase of the change theory involves the discontinuation of the change agent. The significance of the final step suggests that the supporting facilitator is withdrawn from the organization, resulting in the termination of the relationship between the

change agent and the organization. The conceptual underpinning of this quality improvement project is based on a theoretical model for change within an organization. Supportive evidence shows the use of quantitative assessment tools during debriefing to aid in developing and attaining NTS for the SRNA, which can be implemented for organizational change. [1,2,4,8]

Program Structure

The program structure includes an organizational assessment performed on a small, private hospital in South Florida. A thorough examination of strengths, weaknesses, opportunities, and threats (SWOT) was undertaken to assess the efficacy of the proposed educational program for anesthesia providers within the organization. An educational module was developed and designed based on the most up-to-date research and best evidence-based practices for NTS in anesthesia education. Technology is a formidable resource that facilitates the dissemination of educational content. PowerPoint presentations and electronic surveys were used. Academic advisors and clinical coordinators reviewed the educational module before finalizing the presentation. The educational module presented SRNAs and other anesthesia providers (MDAs and CRNAs) that directly interact with students, providing current research on tools for evaluating NTS during a debriefing session after a simulation-based scenario. The strengths, weaknesses, opportunities, and threats (SWOT) analysis was conducted to evaluate the effectiveness of the proposed educational program.

Strengths

Most anesthesia training programs in the United States prepare individuals to provide safe anesthesia in the perioperative setting. Clinical behaviors and skill sets such as NTS are not routinely assessed in academic programs.[1,4] Through a formal educational program, the author hypothesizes that the perceptions of individual SRNAs and anesthesia providers regarding the

development of NTS through debriefing will change positively. Anesthesia providers who interact with students in the clinical setting can also benefit from this educational module in evaluating and promoting NTS in students. The education module is primarily based on the ANTS assessment tool and consists of 4 main categories: situational awareness, decision-making, task management, and teamwork.[1,4] The strength of this program is the ability to bring awareness to students and educators so that debriefing will allow for a more advantageous and sustainable NTS development when they are experiencing situations, whether in simulation or clinical practice.

Weaknesses

Conceivable barriers to implementing this quality improvement project may impact the effectiveness of the educational module. A potential obstacle when implementing a new practice is overcoming resistance from stakeholders and sustaining acceptance. The educational materials are to be prepared and presented in a manner that is appropriate for the targeted audience. The limited number of studies on the benefits of ANTS as a successful measurement of NTS may lead to skepticism within the organization. Another potential weakness is the educator's ability to properly implement the ANTS assessment tool during debriefing. Special care must be taken to ensure adequate understanding for anesthesia educators.

Opportunities

Following an organizational assessment, opportunities for improving NTS in the SRNA are achievable. Research suggests that employing quantitative assessment tools during debriefing is beneficial for developing and acquiring non-technical skills (NTS) for the SRNA, making it a viable strategy for organizational change.[1,2,4,8] First-year nurse anesthesia students who undergo simulation-based training and attend clinical practice are best suited for this educational module.

The SRNA can enhance overall clinical performance and improve patient safety by properly acquiring NTS.[1,2,4,8] Therefore, an opportunity exists to integrate quantitative assessment tools in the clinical setting and implement organizational change.

Threats

Several factors threaten the success of implementing an educational module within the organization. The formal use of NTS assessment tools may be uncommon, and compliance with organizational change may pose challenges for participants. Additionally, the perceptions of anesthesia educators, clinical preceptors, and even the students may threaten the adoption of this novel assessment tool. The method of online delivery could further diminish the perceived value of this quality improvement project for both stakeholders and participants. Overcoming these obstacles requires a thoughtful and inclusive approach to ensure the effective integration of the educational module into the organizational context for sustained change.

Organizational Factors

Organizational factors were considered when developing and designing the educational module. The application of the educational module on the quantifiable tools that may be used for the assessment of NTS were produced under the direction of an interdisciplinary team consisting of faculty advisors, clinical advisors, and a DNP candidate. In addition, the hospital site's clinical coordinator reviewed the educational module to ensure the material follows hospital policies. Any feedback from the clinical coordinator was considered, and appropriate changes were made for compliance. The educational module was finalized and submitted to the faculty adviser for approval. Finally, the educational module was implemented after obtaining approval from the Institutional Review Board at FIU.

V. Methodology

Setting and Participants

Successful implementation of this educational module required a systematic sequence of events to ensure proficiency and long-term sustainability of interventions. The DNP project was implemented in a small, private hospital in South Florida. Anesthesia services are provided 24 hours a day, 7 days a week, to the community of Miami Beach. The operative suites comprise 12 operating rooms along with multiple off-site anesthesia areas. The anesthesia group consists of 23 MDAs and 35 CRNAs. Of those 58 anesthesia providers, only 7 participated in the educational module.

Interventions and Procedures

This educational module intended to enhance anesthesia educators' and anesthesia providers' knowledge of tools available to improve NTS in SRNAs. The academic module was presented via a PowerPoint presentation at the clinical site in Miami Beach, Florida. Before participating in the educational module, all participants completed an electronic questionnaire to assess their current knowledge and attitude toward debriefing SRNA and assessing NTS. The pre-questionnaire and post-questionnaire were delivered electronically via email. The pre-survey was completed immediately before the educational module. The post-survey was completed within 2 weeks of the module presentation. All inquiries and concerns were addressed, and contact information was available for future communication.

Protection of Human Rights

All personal information, such as phone numbers, emails, and participant identifiers, was not collected or stored. Pre- and post-survey responses maintain anonymity to safeguard all

participants' rights and confidentiality. No damage or harm was inflicted on the property or the project participants.

Data Collection

A Microsoft PowerPoint presentation was created and used to deliver the educational module to meet the goals of this project. The data collected included demographic information, knowledge known (or deficit), ethnicity, race, gender, high level of education, and years of experience as an anesthesia provider. All information requested was voluntary. Surveys were produced and dispersed via Qualtrics Survey company and exported to Microsoft Excel for comparison. A comparative assessment was made between the pretest and posttest. IRB standards were followed to ensure the reliability and validity of the collected data.

Data Management and Analysis

The collection, analysis, and management of data were upheld to guarantee security and privacy. The DNP applicant supervised all data management, utilizing password-protected software on a computer provided by the Department of Nurse Anesthesia at FIU. Access to the data collected for this project was restricted to the DNP applicant and DNP faculty advisor. No participant identifiers were collected or stored. Microsoft Excel was used for statistical analysis. Pretest and posttest questionnaires were performed through the Qualtrics Survey company. The data collected was encrypted to ensure participant privacy. The DNP applicant appropriated every measure to safeguard the privacy of all collected sensitive information.

VI. Timeline

A precise timeline was followed to meet all predetermined deadlines and to enhance efficiency. The overall timeline for the distribution of the DNP quality improvement project was 3 months. The pretest and posttest surveys were sent electronically through e-mail. Participants

had a 6-week window to complete the post-survey. In anticipation of compliance with survey completion, an electronic reminder was automatically sent to all participants on Monday of week 3 and Monday of week 6. Prompt closure of the survey was set for the 90th day. After data collection, the survey was analyzed, and results were disseminated.

VII. Results

Demographics

The demographics of the participants are shown below in Table 1. Initially, there was a total of 12 participants (*n* = 12). All participants (*n* = 12) completed the pretest, and only 9 (*n* = 9) participants completed the posttest questionnaire. The participants were equally divided in gender, male (*n* = 6, 50%) and female (*n* = 6, 50%). The ethnicities of the participants included Hispanic (*n* = 4, 33.3%), White (*n* = 3, 25%), Black (*n* = 2, 16.7%), Asian (*n* = 2, 16.7%), and Other (*n* = 1, 8.3%). Data were obtained regarding the age of the participants: 21-30 (*n* = 5, 1.7%); 31-40 (*n* = 5, 1.7%); and 41-50 (*n* = 2, 16.7%). All participants in this educational module were Certified Registered Nurse Anesthetists (CRNAs) (*n* = 12, 100%). The educational level of the participants: master's prepared (*n* = 3, 25%) and doctorate prepared (*n* = 9, 75%). The participants were also asked about their years of clinical experience, which ranged from less 1-2 years (*n* = 10, 83.3%) and 2 to 5 years (*n* = 2, 16.7%). None of the participants had greater than 5 years of experience.

Table 1. Participant Demographics

Demographics	***Null (n)***	***Percentage (%)***
Total Participants	9	75.00%
Gender		
Male	6	50.00%
Female	6	50.00%
Ethnicity		
Hispanic	4	33.33%
Caucasian/White	3	25.00%
African American/Black	2	16.67%
Asian	2	16.67%
Other	1	8.33%
Age		
21-30	5	41.67%
31-40	5	41.67%
41-50	2	16.67%
51-60	-	-
Position/Title		
Resident	-	
CRNA	12	100%
Anesthesiologist	-	
Education		
Bachelor's	-	-
Master's	3	25.00%
Doctorate	9	75.00%
Years of Experience		
1-2 years	10	83.33%
2-5 years	2	16.67%
5-10 years	-	-
Over 10 years	-	-

Pretest: Baseline Knowledge Assessment

Before implementing the educational module, the participants were asked a series of questions to gather a baseline assessment of current knowledge. Participation in the pretest questionnaire was 100% (n = 12). Of the participants, 58.3% (n = 7) correctly answered regarding the acronym ANTS (Anesthesia Non-Technical Skills). Additionally, 91.7% (n = 11) correctly identified the providers that can develop non-technical skills (SRNA, CRNA, Medical

Residents). Also, 91.7% (*n* = 11) of the participants correctly identified the 4 pillars of non-technical skills (decision-making, situation awareness, task management, and teamwork). A total of 65.22% of the participants correctly answered the 2 subcategories of the individual aspect of non-technical skills (decision-making and situation awareness). Another 73.9% of the participants responded correctly to the 2 subcategories of the interpersonal team aspect of non-technical skills (task management and teamwork). All (100%) of the participants understood the complementary relationship between non-technical and technical skills. Additionally, the application of the ANTS checklist was assessed, and 58.33% of the participants chose before simulation, 33.33% of the participants chose during simulation, and 8.33% chose after simulation. This result is illustrated in Figure 1. Additionally, 83.33% of the participants identified the primary benefit of properly developed non-technical skills in an anesthesia provider (patient safety, provider safety, and surgeon safety). Finally, 91.67% of the participants identified positive effects of simulation-based training (recognizing errors, enriching the value of self-confidence, and developing behavioral skills).

Posttest: Baseline Knowledge Assessment

Following the implementation of a video-based educational module, participants were given a posttest questionnaire for review. In the posttest questionnaire**,** only nine (*n* = 9) individuals participated. Among those participants, 58.3% (*n* = 7) correctly answered the acronym ANTS (Anesthesia Non-Technical Skills). There were 88.9% correct responses for identifying providers that can develop non-technical skills (SRNA, CRNA, medical residents). All (100%) of the participants correctly identified the 4 pillars of non-technical skills (decision-making, situation awareness, task management, and teamwork). Another 88.3% of the participants correctly answered the 2 subcategories of the individual aspect of non-technical

skills (decision-making and situation awareness). Additionally, 58.8% of the participants responded correctly to the 2 subcategories of the interpersonal team aspect of non-technical skills (task management and teamwork). Another 88.9% of the participants responded correctly to the complementary relationship between non-technical and technical skills. The application of the ANTS checklist was assessed: 11.1% of the participants chose before simulation, 11.1% chose during simulation, and 77.8% selected after simulation; this result can be seen in Figure 2. Two-thirds (66.7%) of the participants identify the primary benefit of properly developed non-technical skills in an anesthesia provider (patient safety, provider safety, and surgeon safety). Finally, 77.8% of the participants identified positive effects of simulation-based training (recognizing errors, enriching the value of self-confidence, and developing behavioral skills).

Figure 1. Pretest: Best Time to Apply the ANTS Checklist

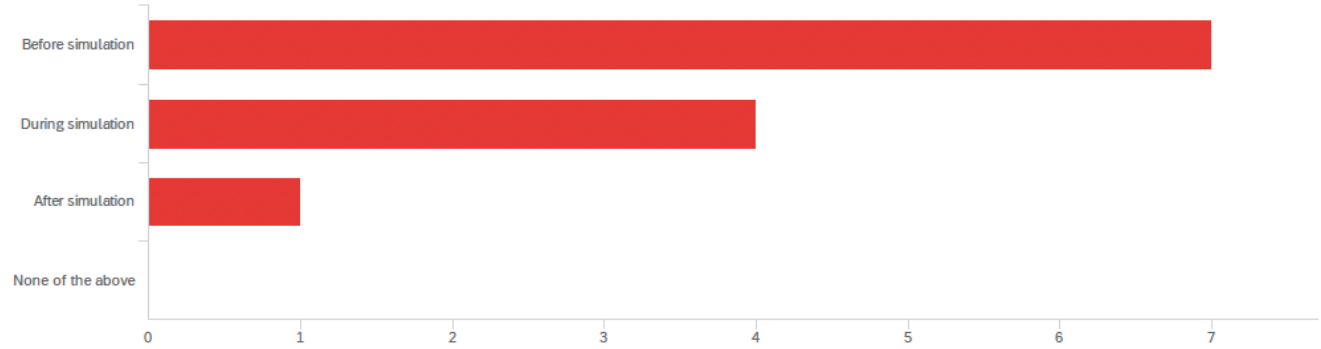

Figure 1 represents a pretest questionnaire on the application of ANTS checklist during simulation-based education.

Figure 2. Posttest: Best Time to Apply the ANTS Checklist

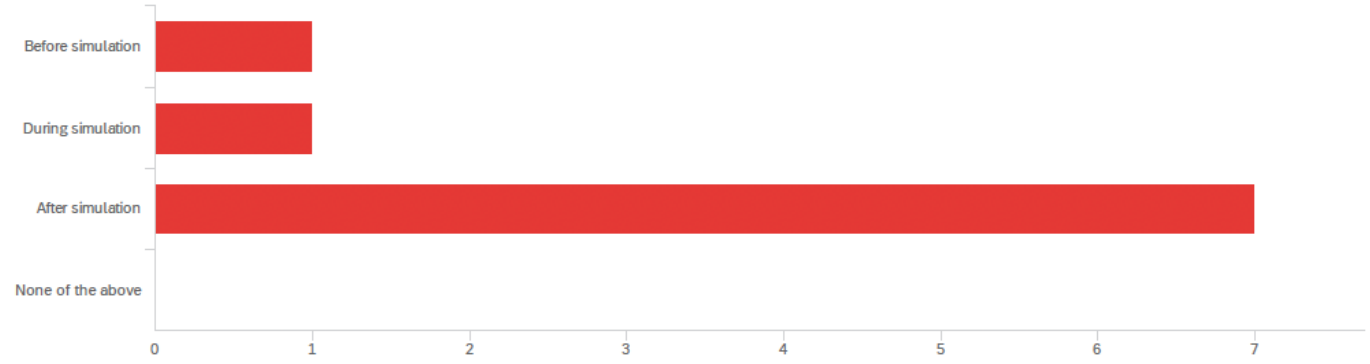

Figure 2 represents a posttest questionnaire on the application of ANTS checklist during simulation-based education.

The comparison between the pretest and posttest results vividly demonstrates the success of the educational module in encouraging providers to utilize the ANTS checklist for enhancing non-technical skills in SRNAs. This comparison is represented in Figure 3 and Figure 4.

Figure 3. Pretest: Likeliness to Utilize ANTS Checklist

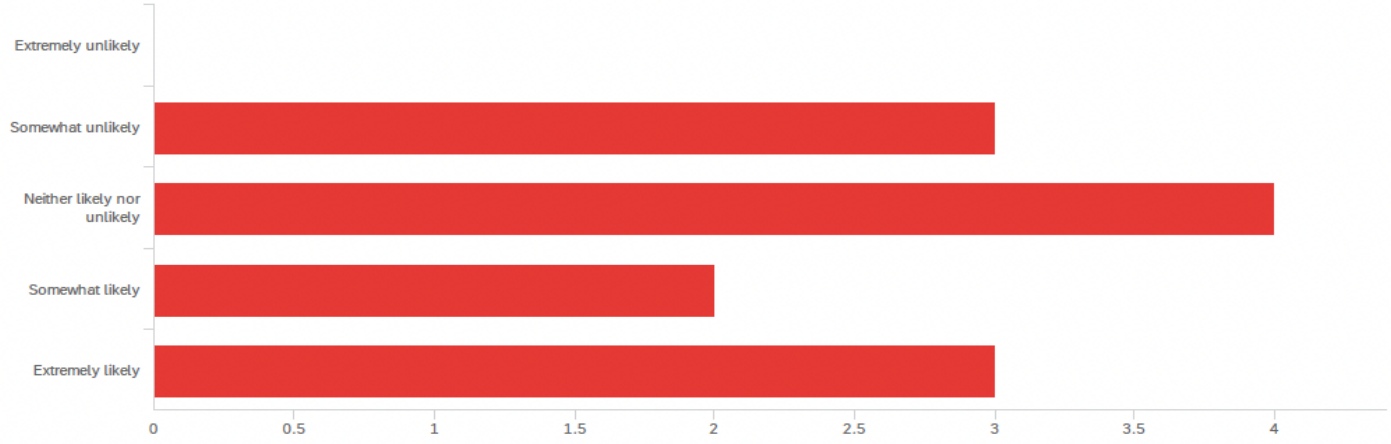

Figure 3 represents a pretest questionnaire on the likeness to utilize ANTS checklist on SRNA when precepting.

Figure 4. Posttest: Likeliness to Utilize ANTS Checklist

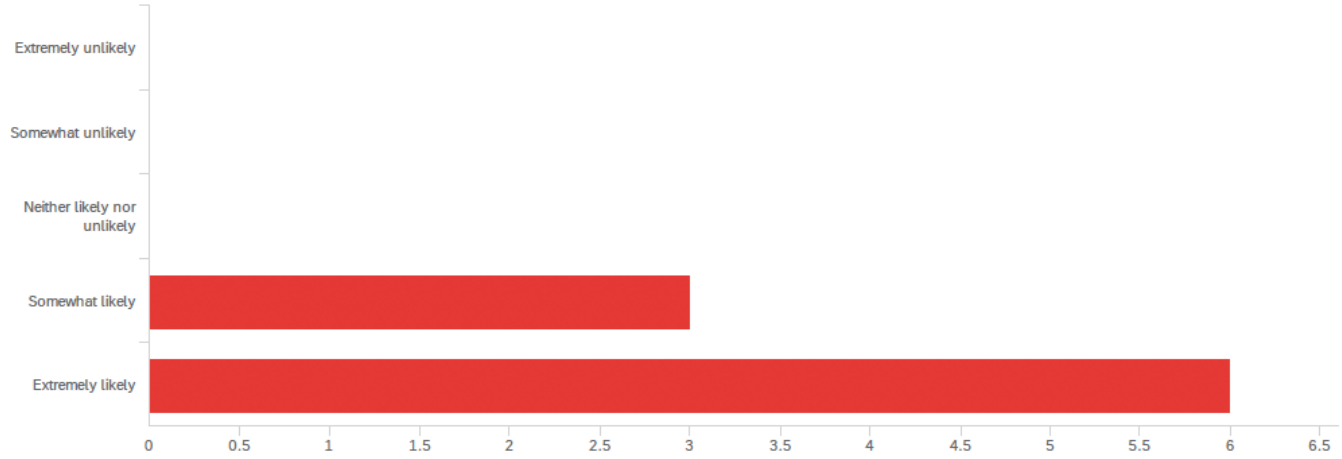

Figure 4 represents a posttest questionnaire on the likeness to utilize ANTS checklist on SRNA when precepting.

Table 2. Pre- and Posttest Responses

Questions (10)	Pretest	Posttest	% Change
1. What does the acronym ANTS stand for?			
a. Anesthesia Non-Technical Skills	7 (58.3%)	7 (58.3%)	0
b. Anonymous Non-Tactical Skills	2 (16.7%)	1 (11.1%)	5.6% ↓
c. Administration for Non-Technical Surveys	1 (8.3%)	1 (11.1%)	2.8% ↑
d. Anesthesia Nurses Technical Skills	2 (16.7%)	-	16.7% ↓
Correct Answer: A			
2. Which of the following providers can develop non-technical skills?			
a. Student Registered Nurse Anesthetist	-	-	-
b. Certified Registered Nurse Anesthetist	-	-	-
c. Medical residents	1 (8.3%)	1 (11.1%)	2.8% ↑
d. All of the above	11 (91.6%)	8 (88.9%)	2.7% ↓
Correct Answer: D			
3. The four main categories of NTS are decision-making, situation awareness, task management, and teamwork? ***True or false:***			
a. True	11 (91.6%)	9 (100%)	8.4% ↑

b. False	1 (8.3%)	-	8.3%	↓
Correct Answer: A				
4. Which two subcategories of NTS are related to related to the individual aspect of NTS? *Select 2:*				
a. Teamwork	2 (16.7%)	1 (5.9%)	10.8%	↓
b. Decision-making	6 (26.1%)	7 (41.2%)	15.1%	↑
c. Task management	6 (26.1%)	1 (5.9%)	20.2%	↓
d. Situation awareness	9 (39.1%)	8 (47.1%)	8.0%	↑
Correct Answer: B, D				
5. Which two subcategories of NTS are related to the social and interpersonal team aspect of NTS? *Select 2:*				
a. Teamwork	11 (47.4%)	9 (52.9%)	5.5%	↑
b. Decision-making	2 (8.7%)	1 (5.9%)	2.8%	↓
c. Task management	6 (26.1%)	1 (5.9%)	20.2%	↓
d. Situation awareness	4 (17.4%)	-	17.4%	↓
Correct Answer: A, C				
6. Do non-technical skill complement technical skills? *True or false:*				
a. True	12 (100%)	8 (88.9%)	11.1%	↓
b. False	-	1 (11.1%)	11.1%	↑
Correct Answer: A				
7. When is the best time to apply the ANTS checklist?				
a. Before simulation	7 (58.3%)	1 (11.1%)	47.2%	↓
b. During simulation	4 (33.3%)	1 (11.1%)	22.2%	↓
c. After simulation	1 (8.3%)	7 (77.8%)	69.5%	↑
d. None of the above	-	-		-
Correct Answer: C				
8. What is a primary benefit of properly developed non-technical skills in an anesthesia provider?				
a. Patient safety	1 (8.3%)	3 (33.3%)	25.0%	↑
b. Provider safety	1 (8.3%)	-	8.3%	↓

c. Surgeon safety	-	-		-
d. All of the above	10 (88.3%)	6 (66.7%)	21.6%	↓
Correct Answer: D				
9. Simulation-based training has been found to have a positive effect which of the following?				
a. Recognizing errors	1 (8.3%)	-	8.3%	↓
b. Enriching the value of self-confidence	-	1 (11.1%)	11.1%	↑
c. Developing behavioral skills	-	1 (11.1%)	11.1%	↑
d. All of the above	11 (91.6%)	7 (77.8%)	13.8%	↓
Correct Answer: D				
10. How likely are you to utilize ANTS checklist when precepting an SRNA?				
a. Extremely unlikely	-	-		-
b. Somewhat unlikely	3 (25%)	-	25.0%	↓
c. Neither likely nor unlikely	4 (33.3%)	-	33.3%	↓
d. Somewhat likely	2 (16.7%)	3 (33.3%)	16.6%	↑
e. Extremely likely	3 (25%)	6 (66.7%)	41.7%	↑

VIII. Discussion

Summary of Data

The data presented in the results section reflect a statistical analysis of the pretest and the posttest questionnaires following the implementation of the educational module. All participants were CRNAs practicing no more than 5 years after graduation. Identical knowledge-based questions were asked on the pretest and posttest to measure whether participants enhanced their knowledge after the educational module. Significant statistical difference was noted for question 7, *When is the best time to apply the ANTS checklist?* A 69.5% increase was recorded from the pretest to the posttest. See Figure 3 and Figure 4. Timely utilization of the ANT checklist is

imperative for developing NTS during the debriefing period if it is the most appropriate time for application.

The pretest and posttest also assessed whether the educational module enhanced the participants' likelihood of utilizing the ANT checklist. On the posttest questionnaire, 66.7% of participants were "extremely likely" to use the ANT checklist, which was a 41.7% increase from the pretest questionnaire responses. See Figure 1 and Figure 2.

Limitations

The quality improvement project had certain limitations. These limitations included a relatively small sample size, virtual implementation of educational modules, and pre-post attrition. A larger sample size would have contributed to more robust results, increased generalizability, and strengthened the overall project. The virtual delivery method, conducted exclusively through an online platform in an asynchronous mode, lacked the opportunity for direct learner interaction or the ability to ask questions. Additionally, attrition among participants was observed. In the pretest questionnaire, there were initially 12 participants (n = 12). However, only 9 participants (n = 9) completed the posttest questionnaire, resulting in an attrition rate of 25%.

Next Steps

The practical implications derived from the findings of this quality improvement (QI) project provide the framework for future QI endeavors. A strong emphasis on continuous education and training in developing NTS should be fundamental to bringing awareness to anesthesia providers. Acknowledging the importance of NTS and actively striving for their enhancement, anesthesia providers can take on a central role in minimizing adverse events,

reducing complications, safeguarding patient health, and enhancing the quality of care within the anesthesia field.

Sustaining Practice Change

Sustainable development of NTS can be accomplished using quantifiable assessment tools. The ANTS checklist is a valuable tool that educators and preceptors can employ to systematically quantify evaluations of NTS in SRNAs during simulated clinical experiences. Furthermore, applying the ANTS checklist remains vital through the deliberate practice of debriefing. Debriefing after simulated or actual clinical events is critical for post-reflection and analysis. Debriefing can provide opportunities to identify performance gaps and serve to improve the SRNA's overall performance. The feedback gained during debriefing sessions enriches the SRNA's knowledge and skills and significantly enhances their forthcoming clinical performance, ultimately improving patient safety.

Incorporating quantifiable NTS assessments into training programs, simulation-based education, and performance evaluations is essential for organizational change. Implementing and sustaining a change in practice that emphasizes the application of the ANTS checklist requires a coordinated effort at both the individual and organizational levels. To facilitate this transition successfully, organizations must prioritize several strategic elements. Fostering a culture that values and supports the development of NTS is a priority. This may include offering ongoing training, resources, and opportunities for educators and healthcare professionals to acquire the necessary skills to facilitate debriefing and employ the ANTS checklist properly. Educational modules, like the one created for this quality improvement initiative, are effective and practical for raising awareness about the significance of developing NTS. Additionally, leadership should

enthusiastically endorse the integration of the ANTS checklist into practice, setting clear expectations for their utilization.

Implications for Practice

Implications for practice of a quality improvement project of this magnitude can be used to elicit practice change in both the clinical setting and the education arena. The findings and insights gained from this successful quality improvement project can lead to enhanced patient care and safety. In the clinical environment, NTS can improve communication among SRNAs and their preceptors during debriefing after a clinical event. Utilizing the ANTS checklist can improve the 4 pillars of NTS: situation awareness, decision-making, task management, and teamwork. The tangible benefits of SBE can be realized through the deliberate practice of debriefing after a simulation.

Similarly, in education, developing NTS in SRNAs leads to an enriched knowledge base and improved skill sets, thus improving forthcoming clinical performance and optimizing patient care. Standardizing and validating assessment tools enables educators to prepare future healthcare professionals better to deliver high-quality care. By integrating the ANTS checklist, educators can better assess the performance and behaviors of SRNAs, which is paramount for the success of their education. The comprehensive understanding gained in this educational module will encourage awareness about the effectiveness of using evaluative debriefing tools to develop NTS successfully in SRNAs.

IX. Conclusion

Anesthesia providers can play a crucial role in reducing perioperative complications, ensuring patient well-being, and elevating the standard of care in the field of anesthesia by acknowledging the significance of NTS and actively working to improve them. Sustainable NTS

development can be achieved using measurable assessment tools and effective debriefing. The ANTS checklist is an instrument educators and preceptors can use to measure NTS in student nurse anesthetists during simulation-based training and clinical scenarios. Evidence supports that using the ANTS checklist can improve the 4 pillars of NTS: situation awareness, decision-making, task management, and teamwork. The substantial benefits of simulation-based education are evident through the deliberate practice of debriefing following a simulation or clinical event.

In conclusion, this quality improvement project was designed to increase the anesthesia providers' understanding of using the ANTS checklist and effective debriefing methods. The comprehensive understanding gained in this educational module promotes awareness about the effectiveness of using evaluative debriefing tools to develop NTS successfully in SRNAs. Additionally, the educational module serves a dual purpose of promoting awareness of NTS by positively influencing attitudes and perceptions toward debriefing after simulation-based education. The author speculates a substantial impact on successfully implementing change through analysis of the results. Standardizing and validating assessment tools to evaluate the performance and development of NTS in SRNAs is vital for successful implementations. Ultimately, the educational module developed for this quality improvement project can effectively drive positive change within a practice setting.

References

1. Wunder LL. Effect of a nontechnical skills intervention on first-year student registered nurse anesthetists' skills during crisis simulation. *AANA J*. 2016;84(1):46-51.
2. Radhakrishnan B, Katikar M, Myatra S, Gautam P, Vinayagam S, Saroa R. Importance of non-technical skills in anaesthesia education. *Indian J Anaesth*. 2022;66(1):64-69. doi:10.4103/ija.ija_1097_21
3. American Association of Nurse Anesthesiology. Become a CRNA. Accessed October 1, 2022. https://www.aana.com/about-us/about-crnas/become-a-crna/
4. Flynn FM, Sandaker K, Ballangrud R. Aiming for excellence: a simulation-based study on adapting and testing an instrument for developing non-technical skills in Norwegian student nurse anaesthetists. *Nurse Educ Pract*. 2017;22:37-46. doi:10.1016/j.nepr.2016.11.008
5. Jones CPL, Fawker- Corbett J, Groom P, Morton B, Lister C, Mercer SJ. Human factors in preventing complications in anaesthesia: a systematic review. *Anaesthesia*. 2018;73(S1):12-24. doi:10.1111/anae.14136
6. Fletcher G, Flin R, McGeorge P, Glavin R, Maran N, Patey R. Anaesthetists' non-technical skills (ANTS): evaluation of a behavioural marker system. *Br J Anaesth*. May 2003;90(5):580-8. doi:10.1093/bja/aeg112
7. Parsons SM, Kuszajewski ML, Merritt DR, Muckler VC. High-fidelity simulation training for nurse anesthetists managing malignant hyperthermia: a quality improvement project. *Clin Simul Nurs*. 2019;26:72-80. doi:10.1016/j.ecns.2018.10.003
8. Flynn FM. Educating for excellence: a cohort study on assessing student nurse anesthetist non-technical skills in clinical practice. Article. *AANA J*. 2022;90(1):1-15.
9. Flynn FM, Valeberg BT, Bing-Jonsson PC, Lyberg AM, Tønnessen S. Experiences using an instrument for non-technical skills in nurse anaesthesia education: a focus group study. *BMC Med Educ*. 2022;22(1):243-243. doi:10.1186/s12909-022-03322-w
10. Uramatsu M, Fujisawa Y, Mizuno S, Souma T, Komatsubara A, Miki T. Do failures in non-technical skills contribute to fatal medical accidents in Japan? A review of the 2010–2013 national accident reports. *BMJ Open*. 2017;7(2):e013678. doi:10.1136/bmjopen-2016-013678
11. Goodman JC, Villarreal P, Jones B. The social cost of adverse medical events, and what we can do about it. *Health Aff*. 2011/04/01 2011;30(4):590-595. doi:10.1377/hlthaff.2010.1256
12. Burden A, Pukenas EW. Use of simulation in performance improvement. *Anesthesiol Clin*. 2018;36(1):63-74. doi:10.1016/j.anclin.2017.10.001
13. Garden AL, Le Fevre DM, Waddington HL, Weller JM. Debriefing after simulation-based non-technical skill training in healthcare: a systematic review of effective practice. *Anaesth Intensive Care*. 2015;43(3):300-308. doi:10.1177/0310057X1504300303
14. Levett-Jones T, Lapkin S. A systematic review of the effectiveness of simulation debriefing in health professional education. *Nurse Educ Today*. Jun 2014;34(6):e58-63. doi:10.1016/j.nedt.2013.09.020
15. Polit D, Beck C. *Resource Manual for Nursing Research: Generating and Assessing Evidence for Nursing Practice.* 11th ed. Wolters Kluwer; 2020.
16. Dang D DS, Bissett K, Ascenzi J, Whalen M. *Johns Hopkins Evidence-Based Practice for Nurses and Healthcare Professionals: Model and Guidelines.* 4th ed. Sigma Theta Tau International.; 2021.

17. Gourbault LJ, Hopley EL, Finch F, Shiels S, Higham H. Non-technical skills for medical students: validating the tools of the trade. *Curēus*. 2022;14(5):e24776-e24776. doi:10.7759/cureus.24776
18. Eismann H, Palmaers T, Tsvetanov S, Hagemann V, Flentje M. Changes of collective orientation through a medical student's anaesthesia simulation course - simulation-based training study with non-technical skills debriefing versus medical debriefing. *BMC Med Educ*. 2019;19(1):337-337. doi:10.1186/s12909-019-1765-x
19. Heaton SR, Little Z, Akhtar K, Ramachandran M, Lee J. Using simulation to train orthopaedic trainees in non-technical skills: A pilot study. *World J Orthop*. 2016;7(8):475-480. doi:10.5312/wjo.v7.i8.475
20. Sá-Couto C, Rodrigues D, Gouveia M. Debriefing or feedback: exploring the impact of two post-scenario discussion methods in the acquisition and retention of non-technical skills. *Acta Med Port*. 2022;36(1). https://doi.org/10.20344/amp.16898
21. Wood TC, Maqsood S, Nanavaty MA, Rajak S. Validity of scoring systems for the assessment of technical and non-technical skills in ophthalmic surgery – a systematic review. *Eye (London)*. 2021;35(7):1833-1849. doi:10.1038/s41433-021-01463-8
22. White KM, Dudley-Brown S, Terhaar MF. *Translation of Evidence into Nursing and Healthcare*. 3rd ed. Springer Publishing; 2019.

Appendix

Appendix A: Summary of Evidence Table

Citation	Research Design	Sample	Variables measured	Data Analysis	Results
Wunder,[1] 2016	Quasi-experimental study pretest posttest design	*N* = 32	IV = Educational intervention DV= Attainment of nontechnical skills	Pretest and Posttest, key action scoring system, and Anesthetists' Non-Technical Skills (ANTS) system	NTS are not acquired through experience, but rather through instruction, educational intervention results in significant improvement of NTS.
Flynn et al,[4] 2017	Quasi-experimental study, pretest posttest design	*N* = 14	IV = Training course DV = Behavioral markers assessment tool, (NANTS-no)	Nurse Anaesthetists' Non-Technical Skills-Norway (NANTS-no)	NANTS-no is suitable for assessing NTS during simulation training in nurse anesthesia education with significant improvement demonstrated across all categories of NTS.
Flynn,[8] 2022	Longitudinal design, linear mixed-effect models	*N* = 20	IV= Structural assessment instrument DV = Developing/ assessing non-technical skills in clinical practice	A 5-point Likert scale rating scale	Structured assessment instrument NANTS-no demonstrated a significant improvement in non-technical skills during nurse anesthesia education.
Garden et al,[13] 2015	Systematic review	*N* = 8	IV = Different aspects of debriefing DV = Improvement in non-technical skills performance in healthcare	Analyses of debriefing methods with inclusion and exclusion criteria for the systematic review	Noticeable lack of empirical data regarding the specific nature of the debriefing process and NTS performance. Noteworthy that a range of tools is now available to enable quantification of debriefing to establish the relationship between the specific behaviors enacted by the debriefer and the subsequent changes in participant performance.

Sá-Couto et al,[20] 2022	Longitudinal double-blinded randomized control study	*N* = 45	IV = Comparison between feedback and debriefing DV = Acquisition and retention of non-technical skills	5-point Likert scale, Wilcoxon signed rank test, Mann-Whitney U test, and computerized statistical analysis	The study demonstrated that both debriefing and feedback are effective as post-scenario discussion methods, promoting acquisition and retention of non-technical skills.
Gourbault et al,[17] 2022	Quantitative questionnaire	*N* = 4	IV = Students and assessors DV = Medical Students' Non-Technical Skills (Medi-StuNTS) tool	Before and after the simulation questionnaire data, with computerized statistical analysis	The Medi-StuNTS tool has shown good usability, good internal structure, and significant beneficial consequences, both in assessing NTS during the simulation and in delivering constructive debriefs.
Eismann et al,[18] 2019	Pre-post design using a survey methodology	*N* = 147	IV = Medical debriefing and TeamGAINS debriefing DV = Anesthesia simulation courses	The reliability of the scales, Wilcoxon test was conducted, and computerized statistical analysis	TeamGAINS increased psychological safety and leader inclusiveness in trainees and can change their attitudes towards teamwork.
Heaton et al,[19] 2016	Pre-post survey design	*N* = 26	IV = An educational intervention using a Delphi technique DV = Attainment of non-technical skills	5-point Likert scale, scenario validity, and predicted impact of the course on future practice	Participants demonstrated improved understanding of non-technical performance, recognized its relevance to patient safety, and expressed a desire for its integration in training.
Wood et al,[21] 2021	Systematic review	*N* = 27	IV = Variation of assessment tools/scoring systems	Validity and reliability status for each scoring system	Scoring systems for TS and NTS have been developed and validated to satisfy training requirements for multiple domains; however, consistency in standard is needed.

			DV= TS and NTS		
Flynn et al,[9] 2022	Focused group study, qualitative descriptive design	*N* = 12	IV = Perceptions of participants DV= SNA and clinical supervisors/ preceptors	Semi-structured interviews with 4 focus groups and analyzed using qualitative content analysis	Increased awareness of non-technical skills when using NANTS-no contributes to a professionalization of the nurse anesthetist role and mentoring/learning process in nurse anesthesia education.

Appendix B: IRB Exemption

FIU | Research & Economic Development
FLORIDA INTERNATIONAL UNIVERSITY

MEMORANDUM

To: Dr. Valerie Diaz

CC: Grabiel Pagan

From: Carrie Bassols, BA, IRB Coordinator CeB

Date: March 6, 2023

Proposal Title: "Effects of Debriefing Methods on the Development of Non-Technical Skills: An Evidence-Based Educational Module"

The Florida International University Office of Research Integrity has reviewed your research study for the use of human subjects and deemed it Exempt via the **Exempt Review** process.

IRB Protocol Exemption #:	IRB-23-0092	**IRB Exemption Date:**	03/06/23
TOPAZ Reference #:	112794		

As a requirement of IRB Exemption you are required to:

1) Submit an IRB Exempt Amendment Form for all proposed additions or changes in the procedures involving human subjects. All additions and changes must be reviewed and approved prior to implementation.
2) Promptly submit an IRB Exempt Event Report Form for every serious or unusual or unanticipated adverse event, problems with the rights or welfare of the human subjects, and/or deviations from the approved protocol.
1) Submit an IRB Exempt Project Completion Report Form when the study is finished or discontinued.

Special Conditions: N/A

For further information, you may visit the IRB website at http://research.fiu.edu/irb.

Appendix C: QI Project Consent

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CONSENT TO PARTICIPATE IN A QUALITY IMPROVEMENT PROJECT

"Effects of Debriefing Methods on the Development of Non-Technical Skills: An Evidence-Based Educational Module"

SUMMARY INFORMATION

Things you should know about this study:

- **Purpose:** Educational module to increase the awareness of educators, preceptors, and students about the effectiveness in using evaluative debriefing tools to cultivate, foster, and successfully develop non-technical skills in student registered nurse anesthetists.
- **Procedures**: If the participant chooses to participate, they will be asked to complete a pretest, watch a voice PowerPoint, and then a post test
- **Duration:** This will take about a total of 20 minutes total.
- **Risks**: There will be minimal risks involved with this project, as would be expected in any type of educational intervention, which may include mild emotional stress or mild physical discomfort from sitting on a chair for an extended period.
- **Benefits:** The main benefit to you from this research is increase the participants knowledge on the tools available that assist with developing non-technical skills in student nurse anesthetists.
- **Alternatives:** There are no known alternatives available to the participant other than not taking part in this quality improvement project.
- **Participation:** Taking part in this quality improvement project is voluntary.

Please carefully read the entire document before agreeing to participate.

NUMBER OF STUDY PARTICIPANTS

If the participant decides to be in this study, they will be one of approximately ten people in this research study.

PURPOSE OF THE PROJECT

The participant is being asked to be in a quality improvement project. The goal of this project is to provide an educational module to optimize the performance and development of non-technical skills in anesthesia providers, including SRNAs, in clinical practice using the Anesthetists Non-Technical Skills debriefing checklist. If you decide to participate, you will be 1 of approximately 10 participants.

DURATION OF THE PROJECT
The participation will require about 20 minutes.

PROCEDURES
If the participant agrees to be in the project, PI will ask you to do the following things:

1. Complete an online 10 question pretest survey via Qualtrics, an Online survey product for which the URL link is provided.
2. Review the educational PowerPoint Module lasting 15 minutes via Qualtrics, an Online survey product for which the URL link is provided.
3. Complete the online 10 question posttest survey via Qualtrics, an Online survey product for which the URL link is provided.

RISKS AND/OR DISCOMFORTS
The main risk or discomfort from this research is minimal. There will be minimal risks involved with this project, as would be expected in any type of educational intervention, which may include mild emotional stress or mild physical discomfort from sitting on a chair for an extended period.

BENEFITS
The following benefits may be associated with participation in this project: An increased participants knowledge on the tools available that assist with developing non-technical skills in student registered nurse anesthetists. The overall objective of the program is to increase the providers' knowledge based on the current literature.

ALTERNATIVES
There are no known alternatives available to the participant other than not taking part in this project. However, if the participant would like to receive the educational material, it will be provided to them at no cost.

CONFIDENTIALITY
The records of this project will be kept private and will be protected to the fullest extent provided by law. If, in any sort of report, PI might publish, it will not include any information that will make it possible to identify the participant. Records will be stored securely, and only the project team will have access to the records.

PARTICIPATION
Taking part in this quality improvement project is voluntary.

COMPENSATION & COSTS
There is no cost or payment to the participant for receiving the health education and/or for participating in this project.

RIGHT TO DECLINE OR WITHDRAW
The participation in this project is voluntary. The participant is free to participate in the project or withdraw the consent at any time during the project. The participant's withdrawal or lack of

participation will not affect any benefits to which you are otherwise entitled. The investigator reserves the right to remove the participant without their consent at such time that they feel it is in their best interest.

RESEARCHER CONTACT INFORMATION

If you have any questions about the purpose, procedures, or any other issues relating to this research project, you may contact Grabiel A. Pagan by phone at 1-(201)-282-1174 or by email at gpaga007@fiu.edu and Dr. Valerie J. Diaz, DNP, CRNA by phone at 1-(305)-348-9027 or by email at vdiaz@fiu.edu.

IRB CONTACT INFORMATION

If the participant would like to talk with someone about their rights pertaining to being a subject in this project or about ethical issues with this project, the participant may contact the FIU Office of Research Integrity by phone at 305-348-2494 or by email at ori@fiu.edu.

PARTICIPANT AGREEMENT

I have read the information in this consent form and agree to participate in this study. I have had a chance to ask any questions I have about this study, and they have been answered for me. By clicking on the "consent to participate" button below I am providing my informed consent.

Appendix D: Recruitment Letter

Nicole Wertheim College of Nursing & Health Sciences

Effects of Debriefing Methods on the Development of Non-Technical Skills: An Evidence-Based Educational Module

Dear Alumni of FIU Dept of Nurse Anesthesiology:

My name is Grabiel A. Pagan, and I am a student from the Anesthesiology Nursing Program Department of Nurse Anesthesiology at Florida International University. I am writing to invite you to participate in my quality improvement project. The goal of this project is to increase health care providers' awareness about the effectiveness in using evaluative debriefing tools to cultivate, foster, and successfully develop non-technical skills in student registered nurse anesthetists. You are eligible to take part in this project because you are a part of the Alumni of FIU Dept of Nurse Anesthesiology.

If you decide to participate in this project, you will be asked to complete and sign a consent form for participation. Next, you will complete a pretest questionnaire, which is expected to take approximately 5 minutes. You will then be asked to view an approximately 15 minutes long educational presentation online. After going through the educational module, you will be asked to complete the posttest questionnaire, which is expected to take approximately 5 minutes. *No compensation will be provided.*

Remember, this is completely voluntary. You can choose to be in the study or not. If you'd like to participate or have any questions about the study, please email or contact me, Grabiel A. Pagan, by phone at 1-(201)-282-1174 or by email at gpaga007@fiu.edu.

Thank you very much.

Sincerely,

Grabiel A. Pagan, MSN, RN, CCRN
1-(201)-282-1174
gpaga007@fiu.edu

Appendix E: Letter of Support

FIU
Department of Nurse Anesthesiology

Nicole Wertheim College of Nursing & Health Sciences

February 7, 2023

Valerie J. Diaz, DNP, APRN, CRNA, CNE, CAPT, USN, NC
Clinical Assistant Professor
Department of Nurse Anesthesiology
Florida International University

Dr. Diaz,

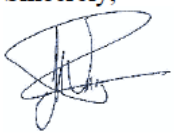
Thank you for inviting FIU alumni to participate in the Doctor of Nursing Practice (DNP) project conducted by Grabiel A. Pagan titled *"Effects of debriefing methods on the development of non-technical skills: an evidence-based educational module"* the Nicole Wertheim College of Nursing and Health Sciences, Department of Nurse Anesthesiology at Florida International University. I have granted the student permission to conduct the project using our providers.

Evidence-based practice's primary aim is to yield the best outcomes for patients by selecting interventions supported by the evidence. This proposed quality improvement project seeks to utilize the latest literature to increase providers' awareness about the effectiveness in using the Anesthetists Non-Technical Skills debriefing checklist to cultivate, foster, and successfully develop non-technical skills in student registered nurse anesthetists.

We understand that participation in the study is voluntary and carries no overt risk. All Anesthesiology providers are free to participate or withdraw from the study at anytime. The educational intervention will be conveyed by a 15-minute virtual PowerPoint presentation, with a pretest and posttest questionnaire delivered by a URL link electronically via Qualtrics, an online survey product. Responses to pretest and posttest surveys are not linked to any participant. The collected information is reported as an aggregate, and there is no monetary compensation for participation. All collected material will be kept confidential, stored in a password-encrypted digital cloud, and only be accessible to the investigators of this study: Grabiel A. Pagan and Dr. Valerie J. Diaz.

Once the Institutional Review Board's approval is achieved, this scholarly project's execution will occur over two weeks. Grabiel A. Pagan will behave professionally, follow standards of care, and not impede hospital performance. We support the participation of our Anesthesiology providers in this project and look forward to working with you.

Sincerely,



Jorge A. Valdes, DNP, CRNA, APRN, FAANA
Chair, Department of Nurse Anesthesiology
Associate Professor

Appendix F: QI Project Survey

Pretest and Posttest Questionnaire:

Effects of Debriefing Methods on the Development of Non-Technical Skills: An Evidence-Based Educational Module

INTRODUCTION

The primary aim of this QI project is to increase providers awareness about the effectiveness in using ANTS checklist, an evaluative debriefing tool, to cultivate, foster, and successfully develop non-technical skills in student registered nurse anesthetists.

Please answer the question below to the best of your ability. The questions are either in multiple choice or true/false format and are meant to measure knowledge development of non-technical skills in the SRNA.

PERSONAL INFORMATION

1. **Gender:** Male Female Other_____
2. **Ages 25 and above: _____**
3. **Ethnicity:** Hispanic Caucasian African American Asian Other_____
4. **Position/Title:** CRNA Anesthesiologist Resident Anesthesiologist Assistant
5. **Level of Education:** Certificate Bachelors Masters DNP PhD
6. How many years have you been a perioperative provider?

   Over 10 5-10 years 2-5years 1-2 years

QUESTIONNAIRE

1. **What does the acronym ANTS stand for?**
    a. Anesthesia Non-Technical Skills
    b. Anonymous Non-Tactical Skills
    c. Administration for Non-Technical Surveys
    d. Anesthesia Nurses Technical Skills
2. **Which of the following providers can develop non-technical skills?**
    a. Student Registered Nurse Anesthetist
    b. Certified Registered Nurse Anesthetist
    c. Medical residents
    d. All of the above
3. **True or false: The four main categories of NTS are decision-making, situation awareness, task management, and teamwork?**
    a. True
    b. False
4. **Which two subcategories of NTS are related to related to the individual aspect of NTS? Select two:**
    a. Teamwork
    b. Decision-making
    c. Task management
    d. Situation awareness
5. **True or false: Do non-technical skill complement technical skills?**
    a. True
    b. False

6. **Which two subcategories of NTS are related to the social and interpersonal team aspect of NTS? Select two:**
    a. Teamwork
    b. Decision-making
    c. Task management
    d. Situation awareness
7. **When is the best time to apply the ANTS checklist?**
    a. Before simulation
    b. During simulation
    c. After simulation
    d. None of the above
8. **What is a primary benefit of properly developed non-technical skills in an anesthesia provider?**
    a. Patient safety
    b. Provider safety
    c. Surgeon safety
    d. All of the above
9. **Simulation-based training has been found to have a positive effect which of the following?**
    a. Recognizing errors
    b. Enriching the value of self-confidence
    c. Developing behavioral skills
    d. All of the above

10. How likely are you to utilize ANTS checklist when precepting an SRNA?

a. Most likely

b. Somewhat likely

c. Somewhat unlikely

d. Most unlikely

Appendix G: QI Educational Module

BACKGROUND:

- **What are Non-Technical Skills?**
  - Non-Technical Skills (NTS) can be defined as "cognitive, social, and personal resource skills" that have a profound impact on an individual's performance and is associated with delivering excellent anesthesia care
- **Significance to Practice**
  - 80% of medical errors are directly related to the unawareness of NTS by the healthcare provider
  - Anesthesia providers with well-developed NTS can abate these statistics to ensure optimal anesthetic care and improved patient safety

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Scope of the Problem

- Anesthesia providers are important players in the perioperative setting especially when it concerns patient safety
- It is important that NTS are well developed to enhance patient safety and avoid mismanagement of patient care
- NTS are not routinely evaluated in nurse anesthesiology training programs

Two Subcategories of NTS

	Categories	Elements
1. Individual Aspect	Situation awareness	▪ Gathering information ▪ Recognizing and understanding ▪ Anticipating and thinking ahead
1. Individual Aspect	Decision making	▪ Identifying possible options ▪ Assessing risks and selecting options ▪ Re-evaluating
2. Team Aspect	Task management	▪ Planning and preparing ▪ Prioritizing ▪ Identifying and utilizing resources ▪ Maintaining standards and levels of quality
2. Team Aspect	Team working	▪ Exchanging information ▪ Assessing roles and capabilities ▪ Co-ordinating activities ▪ Displaying authority and assertiveness ▪ Supporting other team members

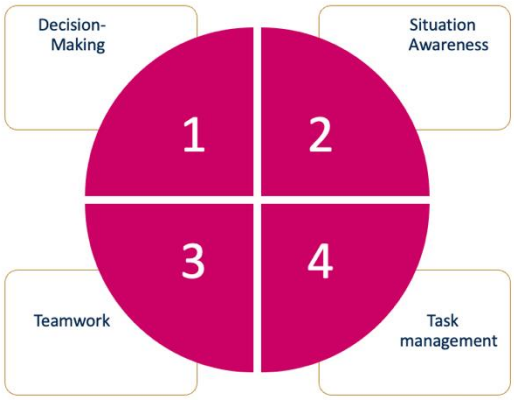
ANTS Checklist vs. Verbal-Only Debriefing

Anesthesia Non-Technical Skills Checklist	Verbal-Only Debriefing
• The ANTS Checklist uses a 4-point scoring system • Provides structure to the debriefing process • Use to specifically assess NST • Research supports the use as a tool evaluate and develop NTS	• Traditional way of debriefing • Facilitators are not always properly trained • Can informal and doesn't require a lot of time to perform • NTS develop in a nonsystematic fashion

FIU

The ANTS Checklist

- The ANTS Checklist uses a 4-point scoring system for each categorical level
- A score of 1 indicates poor performance
- A score of 4 indicates good performance
- There is a minimum score of 4 and maximum score of 16 for each of the four categories



Who can develop non-technical skills?

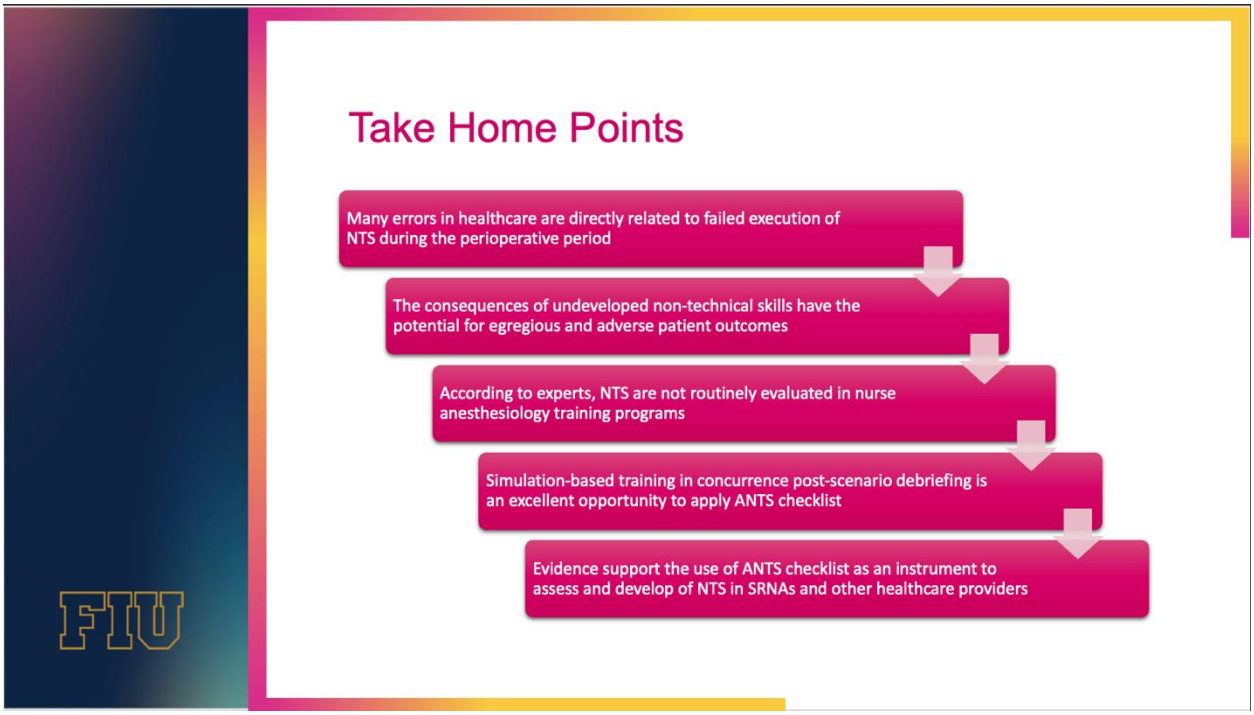
- Student Registered Nurse Anesthetist
- Certified Registered Nurse Anesthetist
- Medical Students and Medical Residents
- Anesthesia Residents
- Surgeons

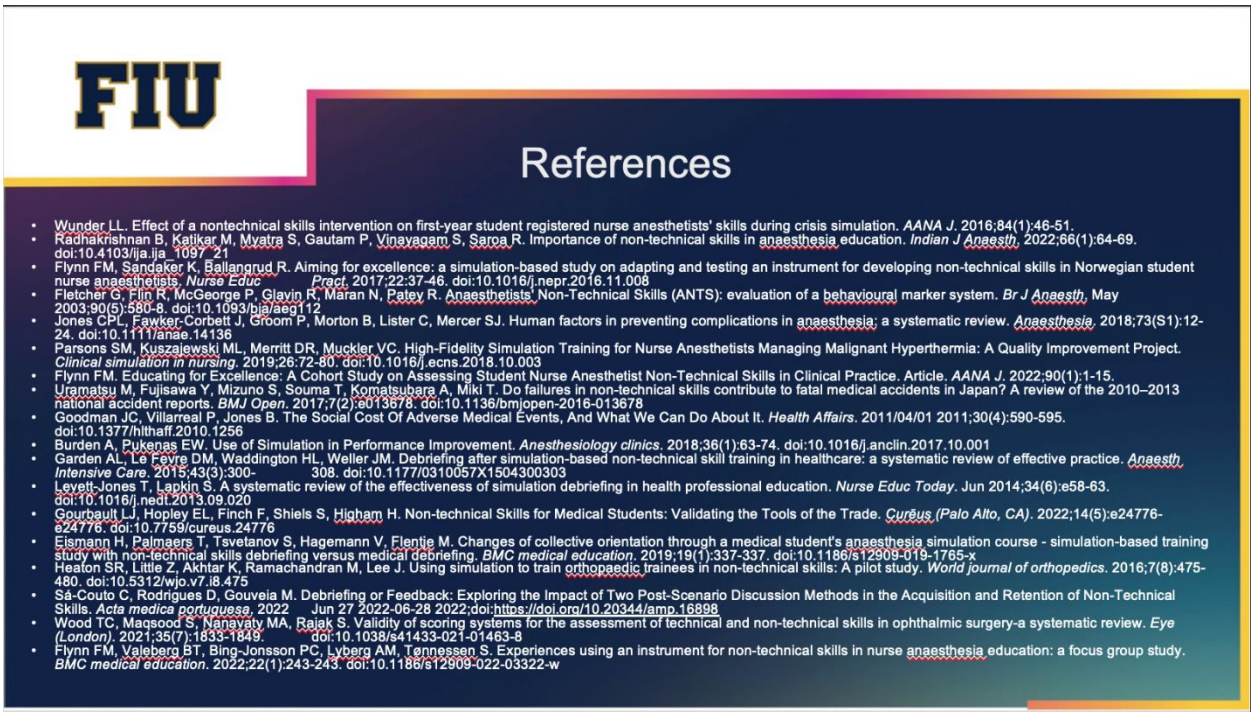
FIU

When is the best time to implement ANTS checklist?

- Debriefing is an important time to bring awareness and promote development of NTS
- The ANTS checklist can be performed after a simulation-based education during post-scenario debriefing.
- ANTS checklist can also be implemented in the clinical setting as part of a clinical evaluation
- Simulation-based training has been found to have a positive effect in recognizing errors, enriching the value of self-confidence, and developing behavioral skills

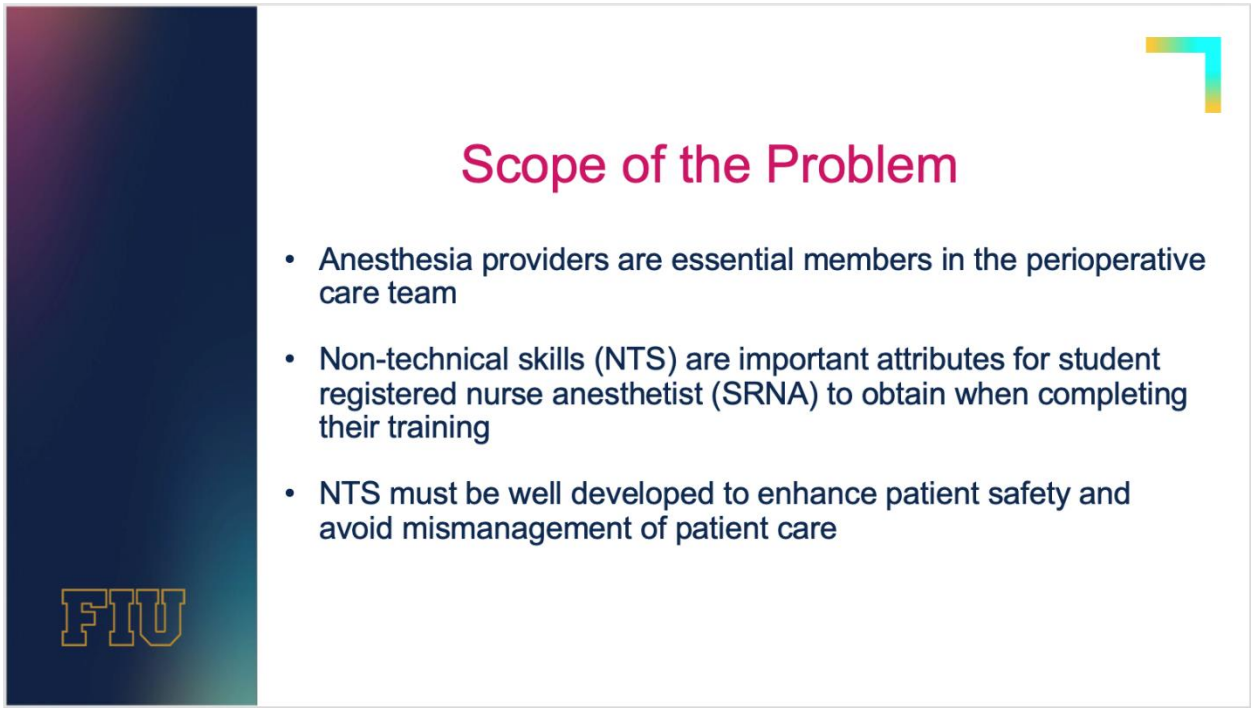
FIU





- Wunder LL. Effect of a nontechnical skills intervention on first-year student registered nurse anesthetists' skills during crisis simulation. *AANA J*. 2016;84(1):46-51.
- Radhakrishnan B, Katikar M, Myatra S, Gautam P, Vinayagam S, Saroa R. Importance of non-technical skills in anaesthesia education. *Indian J Anaesth*. 2022;66(1):64-69. doi:10.4103/ija.ija_1097_21
- Flynn FM, Sandaker K, Ballangrud R. Aiming for excellence: a simulation-based study on adapting and testing an instrument for developing non-technical skills in Norwegian student nurse anaesthetists. *Nurse Educ Pract*. 2017;22:37-46. doi:10.1016/j.nepr.2016.11.008
- Fletcher G, Flin R, McGeorge P, Glavin R, Maran N, Patey R. Anaesthetists' Non-Technical Skills (ANTS): evaluation of a behavioural marker system. *Br J Anaesth*. May 2003;90(5):580-8. doi:10.1093/bja/aeg112
- Jones CPL, Fawker-Corbett J, Groom P, Morton B, Lister C, Mercer SJ. Human factors in preventing complications in anaesthesia: a systematic review. *Anaesthesia*. 2018;73(S1):12-24. doi:10.1111/anae.14136
- Parsons SM, Kuszajewski ML, Merritt DR, Muckler VC. High-Fidelity Simulation Training for Nurse Anesthetists Managing Malignant Hyperthermia: A Quality Improvement Project. *Clinical simulation in nursing*. 2019;26:72-80. doi:10.1016/j.ecns.2018.10.003
- Flynn FM. Educating for Excellence: A Cohort Study on Assessing Student Nurse Anesthetist Non-Technical Skills in Clinical Practice. Article. *AANA J*. 2022;90(1):1-15.
- Uramatsu M, Fujisawa Y, Mizuno S, Souma T, Komatsubara A, Miki T. Do failures in non-technical skills contribute to fatal medical accidents in Japan? A review of the 2010–2013 national accident reports. *BMJ Open*. 2017;7(2):e013678. doi:10.1136/bmjopen-2016-013678
- Goodman JC, Villarreal P, Jones B. The Social Cost Of Adverse Medical Events, And What We Can Do About It. *Health Affairs*. 2011/04/01 2011;30(4):590-595. doi:10.1377/hlthaff.2010.1256
- Burden A, Pukenas EW. Use of Simulation in Performance Improvement. *Anesthesiology clinics*. 2018;36(1):63-74. doi:10.1016/j.anclin.2017.10.001
- Garden AL, Le Fevre DM, Waddington HL, Weller JM. Debriefing after simulation-based non-technical skill training in healthcare: a systematic review of effective practice. *Anaesth Intensive Care*. 2015;43(3):300-308. doi:10.1177/0310057X1504300303
- Levett-Jones T, Lapkin S. A systematic review of the effectiveness of simulation debriefing in health professional education. *Nurse Educ Today*. Jun 2014;34(6):e58-63. doi:10.1016/j.nedt.2013.09.020
- Gourbault LJ, Hopley EL, Finch F, Shiels S, Higham H. Non-technical Skills for Medical Students: Validating the Tools of the Trade. *Cureus (Palo Alto, CA)*. 2022;14(5):e24776-e24776. doi:10.7759/cureus.24776
- Eismann H, Palmaers T, Tsvetanov S, Hagemann V, Flentje M. Changes of collective orientation through a medical student's anaesthesia simulation course - simulation-based training study with non-technical skills debriefing versus medical debriefing. *BMC medical education*. 2019;19(1):337-337. doi:10.1186/s12909-019-1765-x
- Heaton SR, Little Z, Akhtar K, Ramachandran M, Lee J. Using simulation to train orthopaedic trainees in non-technical skills: A pilot study. *World journal of orthopedics*. 2016;7(8):475-480. doi:10.5312/wjo.v7.i8.475
- Sá-Couto C, Rodrigues D, Gouveia M. Debriefing or Feedback: Exploring the Impact of Two Post-Scenario Discussion Methods in the Acquisition and Retention of Non-Technical Skills. *Acta medica portuguesa*. 2022 Jun 27 2022-06-28 2022;doi:https://doi.org/10.20344/amp.16898
- Wood TC, Maqsood S, Nanavaty MA, Rajak S. Validity of scoring systems for the assessment of technical and non-technical skills in ophthalmic surgery-a systematic review. *Eye (London)*. 2021;35(7):1833-1849. doi:10.1038/s41433-021-01463-8
- Flynn FM, Valeberg BT, Bing-Jonsson PC, Lyberg AM, Tønnessen S. Experiences using an instrument for non-technical skills in nurse anaesthesia education: a focus group study. *BMC medical education*. 2022;22(1):243-243. doi:10.1186/s12909-022-03322-w

Appendix H: Dissemination PowerPoint



Scope of the Problem

- Unfortunately, NTS are not routinely evaluated
- Undeveloped NTS have the potential for egregious and adverse outcomes
- The development of NTS leads to an enriched knowledge base and improved clinical skill sets
- NTS can improve forthcoming clinical performance and optimizing patient care

BACKGROUND:

- NTS can be defined as "cognitive, social, and personal resource skills" that have a profound impact on an individual's performance and are associated with delivering excellent anesthesia care
- Eighty percent of medical errors are directly related to the unawareness of NTS
- Well-developed NTS can abate these statistics to ensure optimal anesthetic care and improved patient safety

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BACKGROUND:

- Simulation-based education (SBE) cultivates effective clinical decision-making in a dynamic environment
- SBE, combined with effective debriefing, are conducive for NTS to develop and flourish
- The use of the Anesthesia Non-Technical Skills (ANTS) checklist can improve the four pillars of NTS: situation awareness, decision-making, task management, and teamwork

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DNP Project Purpose

- This capstone project aims to demonstrate the use of quantifiable assessment tools for developing NTS in the SRNA

PICO Clinical Question

In the student registered nurse anesthetist undergoing anesthesiology academic training, how do quantifiable assessment tools during debriefing compare to verbal-only debriefing aid in empirically evaluating and developing non-technical skills?

Quality Improvement Methods

- A literature review was performed using the following databases: EMBASE, PubMed, and CINAHL
- The search keywords used included: *non-technical skill, situational awareness, simulation-based education, debriefing, and student registered nurse anesthetist*
- Evidence appraisal of 10 articles were chosen, included 5 quasi-experimental studies, 2 longitudinal studies, 2 systematic reviews, and 1 focused qualitative group study design in the literature review
- All studies reviewed contained the following outcomes: quantifiable debriefing tool that improved NTS in trainees

Quality Improvement Methods

- A quasi-experimental pretest-posttest design was used to investigate the effect of an educational module on the awareness of quantifiable assessment tools to measure and develop NTS
- Identical pre and post questions were formulated and disseminated via virtual platform
- Surveys was available for six consecutive weeks with two reminder emails employed for responses

Table 1. Participant Demographics

Demographics	Null (n)	Percentage (%)
Total Participants	12	100.00%
Gender		
Male	6	50.00%
Female	6	50.00%
Ethnicity		
Hispanic	4	33.33%
Caucasian/White	3	25.00%
African American/Black	2	16.67%
Asian	2	16.67%
Other	1	8.33%
Age		
21-30	5	41.67%
31-40	5	41.67%
41-50	2	16.67%
51-60	-	-
Position/Title		
Resident	-	
CRNA	12	100%
Anesthesiologist	-	
Education		
Bachelors	-	-
Masters	3	25.00%
Doctorate	9	75.00%
Years of Experience		
1-2 years	10	83.33%
2-5 years	2	16.67%
5-10 years	-	-
Over 10 years	-	-

- Audience size was 113
- 12 responsive participants
- 12 completed pre-test
- 9 completed post-test

Figure 1. Pre-Test Likeness to Utilize ANTS checklist.

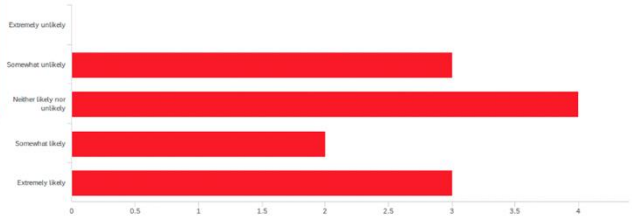

Figure 1 represent a pre-test questionnaire on the likeness to utilize ANTS checklist on SRNA when precepting.

Figure 2. Post-Test Likeness to Utilize ANTS checklist.

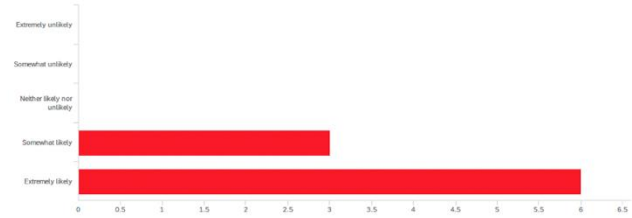

Figure 2 represent a post-test questionnaire on the likeness to utilize ANTS checklist on SRNA when precepting.

Figure 3. Pre-Test Best time to apply the ANTS Checklist

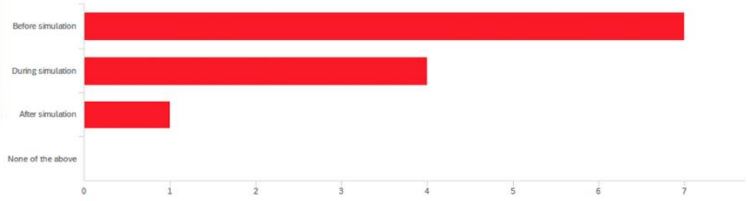

Figure 3 represent a pre-test questionnaire on the application of ANTS checklist during simulation-based education.

Figure 4. Post-Test Best time to apply the ANTS Checklist

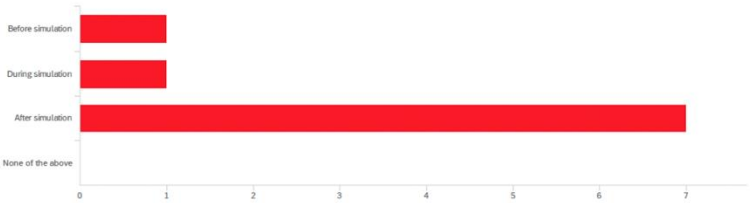

Figure 4 represent a post-test questionnaire on the application of ANTS checklist during simulation-based education.

Discussion

- All participants were CRNAs that were practicing no more than 5 years from graduation
- The pre-test and post-test to measure whether participants augmented their knowledge after the educational module
- Statistical analysis displayed an improved knowledge base in several categories of the pre-test and post-test questionnaires
- Additionally, increase awareness of NTS improved the perception of debriefing after SBE

FIU

Discussion

- A quality improvement project of this magnitude can be used to elicit practice change in both the clinical setting and the education arena
- Using quantifiable assessment tools into anesthesia training programs, SBE, and performance evaluations is important for implementing practice change
- Standardizing and validating assessment tools empower educators and preceptors to prepare future nurse anesthetists to deliver high-quality care
- Timely utilization of the ANTS checklist is imperative for developing NTS

FIU

Limitations

- Small sample size
- Virtual implementation of educational module
- Pre- & Post- attrition rate

Conclusion

- This quality improvement project was designed to increase the understanding of using the ANTS checklist and effective debriefing methods
- The understanding gained in this educational module promotes awareness about the effectiveness of using evaluative debriefing tools
- In addition, this educational module positively influenced the attitudes and perceptions regarding debriefing after SBE
- Anesthesia providers can play a crucial role in reducing perioperative complications, ensuring patient well-being, and elevating the standard of care in the field of anesthesia

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References

- Wunder LL. Effect of a nontechnical skills intervention on first-year student registered nurse anesthetists' skills during crisis simulation. *AANA J*. 2016;84(1):46-51.
- Radhakrishnan B, Katikar M, Myatra S, Gautam P, Vinayagam S, Saroa R. Importance of non-technical skills in anaesthesia education. *Indian J Anaesth*. 2022;66(1):64-69. doi:10.4103/ija.ija_1097_21
- Flynn FM, Sandaker K, Ballangrud R. Aiming for excellence: a simulation-based study on adapting and testing an instrument for developing non-technical skills in Norwegian student nurse anaesthetists. *Nurse Educ Pract*. 2017;22:37-46. doi:10.1016/j.nepr.2016.11.008
- Fletcher G, Flin R, McGeorge P, Glavin R, Maran N, Patey R. Anaesthetists' Non-Technical Skills (ANTS): evaluation of a behavioural marker system. *Br J Anaesth*. May 2003;90(5):580-8. doi:10.1093/bja/aeg112
- Jones CPL, Fawker-Corbett J, Groom P, Morton B, Lister C, Mercer SJ. Human factors in preventing complications in anaesthesia: a systematic review. *Anaesthesia*. 2018;73(S1):12-24. doi:10.1111/anae.14136
- Parsons SM, Kuszajewski ML, Merritt DR, Muckler VC. High-Fidelity Simulation Training for Nurse Anesthetists Managing Malignant Hyperthermia: A Quality Improvement Project. *Clinical simulation in nursing*. 2019;26:72-80. doi:10.1016/j.ecns.2018.10.003
- Flynn FM. Educating for Excellence: A Cohort Study on Assessing Student Nurse Anesthetist Non-Technical Skills in Clinical Practice. Article. *AANA J*. 2022;90(1):1-15.
- Uramatsu M, Fujisawa Y, Mizuno S, Souma T, Komatsubara A, Miki T. Do failures in non-technical skills contribute to fatal medical accidents in Japan? A review of the 2010–2013 national accident reports. *BMJ Open*. 2017;7(2):e013678. doi:10.1136/bmjopen-2016-013678
- Goodman JC, Villarreal P, Jones B. The Social Cost Of Adverse Medical Events, And What We Can Do About It. *Health Affairs*. 2011/04/01 2011;30(4):590-595. doi:10.1377/hlthaff.2010.1256
- Burden A, Pukenas EW. Use of Simulation in Performance Improvement. *Anesthesiology clinics*. 2018;36(1):63-74. doi:10.1016/j.anclin.2017.10.001
- Garden AL, Le Fevre DM, Waddington HL, Weller JM. Debriefing after simulation-based non-technical skill training in healthcare: a systematic review of effective practice. *Anaesth Intensive Care*. 2015;43(3):300-308. doi:10.1177/0310057X1504300303
- Levett-Jones T, Lapkin S. A systematic review of the effectiveness of simulation debriefing in health professional education. *Nurse Educ Today*. Jun 2014;34(6):e58-63. doi:10.1016/j.nedt.2013.09.020
- Gourbault LJ, Hopley EL, Finch F, Shiels S, Higham H. Non-technical Skills for Medical Students: Validating the Tools of the Trade. *Cureus (Palo Alto, CA)*. 2022;14(5):e24776-e24776. doi:10.7759/cureus.24776
- Eismann H, Palmaers T, Tsvetanov S, Hagemann V, Flentje M. Changes of collective orientation through a medical student's anaesthesia simulation course - simulation-based training study with non-technical skills debriefing versus medical debriefing. *BMC medical education*. 2019;19(1):337-337. doi:10.1186/s12909-019-1765-x
- Heaton SR, Little Z, Akhtar K, Ramachandran M, Lee J. Using simulation to train orthopaedic trainees in non-technical skills: A pilot study. *World journal of orthopedics*. 2016;7(8):475-480. doi:10.5312/wjo.v7.i8.475
- Sá-Couto C, Rodrigues D, Gouveia M. Debriefing or Feedback: Exploring the Impact of Two Post-Scenario Discussion Methods in the Acquisition and Retention of Non-Technical Skills. *Acta medica portuguesa*. 2022 Jun 27 2022-06-28 2022;doi:https://doi.org/10.20344/amp.16898
- Wood TC, Maqsood S, Nanavaty MA, Rajak S. Validity of scoring systems for the assessment of technical and non-technical skills in ophthalmic surgery-a systematic review. *Eye (London)*. 2021;35(7):1833-1849. doi:10.1038/s41433-021-01463-8
- Flynn FM, Valeberg BT, Bing-Jonsson PC, Lyberg AM, Tønnessen S. Experiences using an instrument for non-technical skills in nurse anaesthesia education: a focus group study. *BMC medical education*. 2022;22(1):243-243. doi:10.1186/s12909-022-03322-w