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Anesthesia Handoff: A Quality Improvement Project

Callesha Wright
Florida International University, cwrig065@fiu.edu

Vicente Gonzalez
Florida International University, gonzalv@fiu.edu

Erica Camhi
ericacamhi@yahoo.com

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Anesthesia Handoff: A Quality Improvement Project

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By

Callesha Wright, MSN, RN, CCRN

Supervised By

Vicente Gonzalez, DNP, CRNA, APRN

Erica Camhi, DNP, CRNA, APRN

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Abstract

An adequate anesthesia handoff detailing vital components valuable to the continuing care of the patient is necessary to provide safe post-operative care.

Background
Patients undergoing general anesthesia are at significant risk for adverse events in the postoperative period, and the transfer of care from the anesthesia provider to the post-anesthesia care unit nurse is a critical time in a patient's hospital stay. Communication between the releasing and receiving providers must be clear, concise, and complete, showcasing teamwork and a shared goal of patient safety. The purpose of this project is to address the problem of variances in anesthesia handover. The lack of a standardized handover process creates an opportunity for poor handover, compromising patient safety.

Method
This quality improvement project was performed using a pre-test and post-test to assess the knowledge level and attitudes toward anesthesia handoff among anesthesia providers at a Level 1 trauma center in South Florida. The providers voluntarily participated in a pre-survey followed by an educational module, then a post-survey, all provided to them via an anonymous emailed invitation. The data from both surveys were statistically analyzed to determine the educational modules' effectiveness and impact on clinical personnel.

Results
Upon completion of the educational module, there was a noted increase in knowledge of the importance of adequate anesthesia handoff among participants. Based on the results, participants expressed a willingness to adapt a standardized handoff protocol to their current practice. This coincides with the results of the literature review in which the addition of a standardized anesthesia handover protocol offers valuable benefits to patient safety.

Discussion
Clear communication during the transfer of care is essential to a seamless transition for the patient. A standardized handover tool sets the stage for a well-structured handover process to ensue, thus making it a valuable tool to employ at this South Florida Trauma Center. Effective handoffs are detrimental to ensuring the safety, quality, and continuity of patient care. Although handoffs are common in healthcare, there is an extensive degree of variation in terms of the structure of the report and the type of information included. Based on the feedback received, the anesthesia providers there are in full support of endorsing a handover tool and offer their cooperation should a protocol be adapted. Limitations to this study include a small sample size and limited cooperation.

Keywords: Anesthesia handoff, PACU handover, patient safety

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DNP Project Title

Improving the safety of post-surgical patients and increasing the ability of the receiving provider to provide care to the post-surgical patient

PICO Question/ Purpose

Population (P): Anesthesia providers

Intervention (I): Anesthesia handoff tool

Comparison (C): Standard report with no anesthesia handoff tool

Outcomes (O): Improved patient safety and increased PACU RN competency in caring for post-surgical patients

Introduction

Problem Identification

The post-operative handover process is a critical component in the care of a post-surgical patient. There is an ongoing inconsistency on what elements should be included to provide a thorough and comprehensive patient report. Handoff is the transfer of professional responsibility and accountability to an additional healthcare provider for the short or long term.[1] Patients who have been put under general anesthesia are in critical condition and at significant risk for adverse events. Inadequate handoff in this patient population increases the likelihood of severe consequences for these patients.

Several factors affect the quality of post-operative handoff. Postsurgical patients are in critical condition; therefore, the providers receiving them may be distracted when dealing with pressing emergencies.[1] If the PACU nurse's attention is directed toward the patient rather than the details from the provider transferring care, the quality of handoff is reduced, leaving room for missed and misunderstood information. The fast pace in the PACU limits PACU nurses to

comprehending a complex amount of data within a limited time frame. Because the different entities' roles vary, anesthesia providers and PACU nurses may have varying concerns about patient conditions. Each entity may need different information about the patient's condition to complete their care phase, posing an additional challenge to the handoff process. The PACU is a patient care area that consists of many distractions. Handover is regularly interrupted by ongoing nursing activities.[1] Frequent interruptions pose the risk of omitting valuable information during handoff. Considering these factors, it would be appropriate to implement a standardized handoff tool that provides all relevant information, minimizes the potential for poor handoff, and inadvertently improves the safety and quality of patient care and improves the care delivered by PACU nurses.

Background

Handoff involves the transition of care between releasing and receiving clinicians.[2] The transition of care consists of the transfer of information, responsibility, and control of the patient between the releasing and receiving provider.[3] Effective handoffs are detrimental to ensuring the safety, quality, and continuity of patient care. Although handoffs are common in healthcare, there is an extensive degree of variation in terms of the structure of the report and the type of information included.[2] During an assessment of sentinel events, the Joint Commission identified communication breakdown during patient handoffs as a significant issue impacting as many as 80% of critical medical errors.[2] Medical errors account for more than 17 billion dollars and have a mortality rate of 200,000 to 400,000 patient deaths yearly.[2] That being said, a primary area of interest is developing solutions to combat or prevent communication breakdowns to prioritize safe patient care. The standardized checklist promotes a more structured transfer of care,

increases knowledge transfer, improves the accuracy of transmitted information, and decreases the omission of vital patient data.[2]

Handoffs occur daily concerning patient care. For such a common occurrence, there is no formal training or education centered around providing an accurate and complete handoff. There is also no standardization regarding what critical components need to be included in handoff. For ages, providers have provided patient reports based on recall promoting extensive omission of pertinent health data. Using a standardized checklist has been shown to increase safety in numerous fields, including aviation and emergency response dispatching, two areas involving high stakes similar to a patient undergoing general anesthesia.[2] The goal of transition of care is to provide an accurate and complete report of the patient's current state to ensure a seamless transition of care between providers.[4] Using a standardized checklist creates the stage to achieve this goal.

Scope of the Problem/Summary of Literature

Ineffective handoff is a large-scale problem affecting countless amounts of individuals. A typical teaching hospital encounters more than 4,000 handoffs per day. While it sounds simple, a high-quality handoff can be very complex.[5] In 2006, the joint commission established a national patient safety goal addressing handoff requirements that eventually became a national standard by 2010.[3] Standard PC.02.02.01 states that organizations must enact a handoff process that provides the opportunity for discussion between providers and includes information ranging from the patient's condition, care treatment, medications, services, and any recent or anticipated changes involving any of these details.[3] Given the frequency of handoffs, they are often conducted too casually, but to ensure the continuity of care, handoffs should be structured and detailed.[3]

In 2016, a study noted that inadequate communication contributed to 30% of all malpractice claims, 1,744 deaths, and resulted in 1.7 billion dollars in malpractice costs over five years.[3] An assessment of handoff participants revealed that senders reported 21% of handoffs to be unsuccessful, attributed to inattention, lack of knowledge about the patient, and citing delays, while receivers said that 37% of handoffs were unsuccessful.[3] Factors contributing to communication breakdowns during handoffs include insufficient/misleading information, a lack of safety culture, insufficient time, ineffective communication methods, absence of standardized procedures, and inadequate staffing.[3] The Accreditation Council for Graduate Medical Education found that 69% of clinical learning environments had no standardized handoff process.[3] A few Joint Commission recommendations aimed at improving handoff communication from a systematic standpoint include an organizational acknowledgment that successful handoff is a priority and an expectation, information from various sources should be synthesized rather than reported individually, measuring specific causes of poor handoff and creating solutions that target those causes, and enactment of solid leadership and resources, that continually monitor, reinforce, and improve handoff processes.[3,6]

Consequences of the Problem

The consequence of not addressing the problem surrounding inadequate handoff is critical. Ineffective handoff communication contributes to adverse events, including sentinel events resulting in serious patient injury or death.[6] The Joint Commission's sentinel event database includes instances of inadequate handoff communication that eventually lead to adverse events. Some of the adverse events contained in the reports include wrong-site surgery, delays in treatment, falls, and medication errors.[3] Additionally, increased length of hospital stays, patient morbidity, cardiac arrest, death, and more have occurred.[3] Although safety and quality of patient

care are critical, the operating room is a high-risk area, further compromised by complexity, task density, production pressure, stress, and various patient and procedural factors, placing patients at risk for adverse events.[4] Distractions, interruptions, and production pressure are all barriers to safe patient handoff. Thus, the safety and quality of patient care depend on teamwork, communication, and a collaborative work environment and culture.[4]

Knowledge Gaps

Using standardized handoffs or checklists has improved the transfer of information between sending and receiving providers. However, it is vital to recognize that the relationship between anesthesia care handover and adverse outcomes is more than likely an association rather than one of cause and effect.[4] It is difficult to determine specific instances in which a negative patient outcome could be directly linked to an ineffective handoff. Also, although implementing a standardized handoff tool is valuable, there is much variation in which handoff tool is most complete and yields the best results. To date, there are several handoff tools, including "WHAT," "TIME," and "IPASS," so there is inconsistency about what information is necessary to make handoff complete without overloading the PACU nurse with irrelevant information. There is a need for a handoff tool that addresses the most critical details that enable PACU nurses to continue patient care.[7] A collaborative effort between both entities will be required to develop a tool that addresses this gap. Handoff education and training is another area lacking research. As far as we know, there is no formal or standard training that anesthesia providers receive related to providing adequate and accurate handoffs. There is a need to understand current handoff training and practices in better detail to implement a plan that addresses actual issues surrounding handoff.

Proposal Solution

The proposed solution to this problem is adding a standardized handoff tool. Providers from the anesthesia department will be asked to take a pretest to assess their current perception of anesthesia handoffs, what type of information is given during handoffs, what kind of information is expected, and what items could be of more value if included in the handoff tool. After reviewing an educational module that will be available to employees for eight weeks, employees will be asked to take a posttest to assess their perceived quality of the handover process and whether they believe the module and proposed tool have improved or influenced their care and allowed them to practice more safely in the post-anesthesia care unit. The outcomes being measured are a notable improvement in anesthesia to PACU handoff, provider satisfaction, and improved patient safety with the addition of the new handoff tool.

PICO

Patient population/Problem:

For the course of this DNP project, the student nurse anesthetist will assess the post-anesthesia care handoff process in its entirety with the aim of implementing a handoff tool that improves the handoff process and improves the safety and quality of care of the transferring post-surgical patient. The post-operative handover process is a critical component in the care of a post-surgical patient, and there is an ongoing inconsistency on what components should be included to provide a thorough and comprehensive patient report. Handoff is defined as the transfer of professional responsibility and accountability to an additional healthcare provider for either a short or long-term period.[8] Patients who have been put under general anesthesia are in critical condition and at significant risk for adverse events. Inadequate handoff in this patient population leads to an increased likelihood of severe consequences for these patients.

Several factors affect the quality of post-operative handoff. Postsurgical patients are in critical condition; therefore, the providers receiving them may be distracted when dealing with pressing emergencies.[9] If the PACU nurse's attention is directed toward the patient rather than the details coming from the provider transferring care, the quality of handoff is reduced, leaving room for missed and misunderstood information. The fast pace in the PACU limits PACU nurses to have to comprehend a complex amount of information within a limited time frame. Because the role of the different entities varies, anesthesia providers and PACU nurses may have varying concerns about patient conditions. Each entity may need different information about the patient condition in order to complete their phase of care, posing an additional challenge to the handoff process.[3] The PACU is a patient care area that consists of many distractions. Handover is regularly interrupted by ongoing nursing activities.[1] Frequent interruptions pose the risk of omitting valuable information during handoff. With consideration of these factors, it would be appropriate to implement a standardized handoff tool that provides all relevant information, minimizes the potential for poor handoff, and inadvertently improves the safety and quality of patient care and improves the care delivered by PACU nurses.

Intervention/Comparison:

The intervention of this PICO is the implementation of a standardized post-anesthesia handoff tool. Nurse anesthetists, anesthesiologists, and nurses have varying focal points during handover. Anesthesia personnel are often uncertain about what information PACU nurses consider essential or valuable.[5] Reports from PACU nurses consistently revealed that they had been given nonvital information from anesthesia personnel as they often received reports of the anesthesia process rather than essential information that pertained to ongoing patient care.[5] It is valuable to report information about the anesthesia process if there is a deviation or an abnormal

response. Otherwise, including that information during handoff lengthens the report and distracts the receiver from more vital information. Nurse anesthetists note the value of improved cooperation and collaboration between themselves and the PACU team to improve handoffs. Communication failures during patient handoffs are the top cause of anesthesia-related sentinel events and are associated with increased patient morbidity and mortality.[6] In creating a standardized handover, there will be an improvement in the quality, safety, and satisfaction with post-anesthesia handoffs, as compared to the lack of a standardized handoff, which can have detrimental effects, including death.

Outcome:

The outcome being measured is a noted improvement in anesthesia to PACU handoff, provider satisfaction, and improved patient safety with the addition of the new handoff tool. Providers from the anesthesia department will be asked to take a pretest to assess their current perception of anesthesia handoff, what type of information is given and received during handoffs, what type of information is expected, and what items could be of more value if included in the handoff tool. After the implementation of a selected handoff tool, employees will be asked to take a posttest that will assess their perceived quality of the handoff tool and whether they believe the tool has improved or influenced their care and allowed them to practice more safely in the post-anesthesia care unit.

Definition of Terms

Anesthesia Handoff

A hand-off is "a transfer and acceptance of patient care responsibility achieved through effective communication. It is a real-time process of passing patient-specific information from one caregiver to another or from one team of caregivers to another for the purpose of ensuring

the continuity and safety of the patient's care."[3] Potential patient harm exists when handoff communication is inaccurate, incomplete, not timely, misinterpreted, or irrelevant.[3]

Theoretical Framework

Lippitt's model of change is the theoretical framework that will be used to guide the integration of this project. This seven-step model for change incorporates the importance of leader and change agent roles. The seven steps are to (1) develop a need for change by diagnosing the problem, (2) establish a changing relationship and assess the capacity to change, (3) clarify the assessment for change and determine resources, (4) establish goals and intentions for an action plan, (5) examine alternatives, (6) transform intentions into change, (7) stabilize the change.[10] Each step provides an outlet for a safer, higher-quality patient care environment.

Methodology of Literature Review

For this project, a thorough review of existing literature was conducted. The academic databases searched include PubMed, Cinahl, and Google Scholar. The keywords used in this search were "anesthesia handoff," "handoff tools," "handover communication," "anesthesia," and "PACU transfer of care." The articles considered were dated between 2013 and the present. The search strategy revealed a total of 180 peer-reviewed journals concerning anesthesia handoff. Of the 180 titles, the author reviewed research that contained further details about handoff between anesthesia providers and PACU nurses, barriers to adequate communication, handoff education and training, and successful handoff tools in use. Patient safety and provider satisfaction were also assessed. Intraoperative handoff, anesthesia to ICU handoff, and pediatric-specific data were excluded. Using the John Hopkins Evidence-based Practice Appendix C tool, the author reviewed the included articles for quality and significance to the given topic. After

appraisal, articles containing Level I and Level II evidence, consisting of systematic reviews, meta-analyses, and randomized controlled trials, were used to support the research topic.

Literature Review

PACU Handover

Handover is a process intended to accurately and adequately transfer patient care between providers. The ultimate goal of patient handoff is to promote continued nursing care in a safe manner. High-quality handovers play a vital role in improving the delivery of quality care.[1] Handover presents an opportunity for relieving providers to review care and correct any potential mistakes.[7] To date, there is no standardized handover process for patients transferring to PACU after general anesthesia. A lack of standardization increases potential adverse outcomes because handovers are often quick, informal, incomplete, and inaccurate. With the current handover process, the omission of valuable information is frequent, and information viewed as valuable may differ between providers.[11] A clear and concise handover method is the best way to improve the transfer of patient care and, ultimately, the patient's safety.

Barriers to Communication

There is a strong correlation between inadequate communication, information loss, and adverse patient outcomes.[7] Communication is composed of not only sharing information but processing and understanding details of the information that is being transmitted. Effective communication is vital to patient safety, especially when care is being transferred between providers. There are many barriers that create a break in the communication between anesthesia providers and PACU nurses. The environment in PACU can be complex and chaotic. During information exchange, it is common to be interrupted by ongoing nursing activities.[12] People-related factors affecting information transfer include poor teamwork, selective attention, lack of

compliance, and a lack of awareness of the criticalness of what is being relayed.[8] Other factors noted were fragmented and redundant reporting, production pressure, and difficulty enacting change within an organization.[12]

Handoff Education

Handoffs are not simply information transfer. Handoff is a complex process dependent on thoroughness and accuracy. To be successful, handoffs must consist of a mutual discussion precluding a mutual understanding.[9] Handoffs propose a critical opportunity for errors, and anesthesia residents report a lack of consistency as a significant hindrance to handoff education.[9] Existing literature confirms that there is a lack of consistency surrounding best handoff practices. As a result, there is no agreed-upon method by which to educate upcoming anesthesia providers. In a qualitative interview study consisting of 30 anesthesia residents, there was a noted inconsistency in handoff training. During the study, anesthesia residents shadowed two different attendings each for a 2-week period.[9] Per the residents, the handoff was approached variably between attendings. Some had a very structured systematic approach, while others insisted that as long as everything was covered, the order had no significance.[4] Feedback about handoff from residents included implementation of a structured template for handover as many felt that such training from the beginning is critical to developing proper handoff technique.[9] They recollect finding it difficult to ascertain what components were critical to a thorough handoff, increasing their confusion and discomfort with the handover process. Subsequently, residents suggested an organized handoff tool as a means to improve their learning and boost their execution of the handover process.[9]

Successful Handoff Tools

There are several handoff tools in use, but there is no consistent standard handover pattern, and the validity of these tools necessitates verification.[12] The SBAR tool is versatile and has been widely used across various healthcare disciplines. Components of SBAR include the situation (description of events), background (patient's medical history), assessment (current assessment and findings related to patient condition), and recommendations (further treatment, management, and monitoring necessary).[1] This pattern is simple and easy to recall, but more relevant studies are needed to confirm its reliability and applicability to PACU patients. It is a general tool and lacks some focused assessment details pertinent to the postoperative patient. The PEARLS tool is another relevant perioperative handover tool in use. Its components include P (patient name, procedure, primary language, past medical history, positioning, precaution, personal items, and pain management), E (extremities, equipment needs, elimination), A (assessment, antibiotic), R (relationships, radiology), L (laboratory needs, lines), and S (special devices, special needs, and surgical unit).[13] Advantages of the PEARLS include its comprehensiveness and contribution to high-quality handovers. It is extensive, owing to a reduced risk of rapid intervention secondary to a lack of critical handover. Disadvantages include time limitations of the personnel using it and lack of evidence related to its impact on adverse events.[13]

The ABCDEF tool was adopted from the primary trauma assessment tool. Its components include airway, breathing, circulation, disability, exposure, focus, and plan. This tool has improved the efficiency and quality of patient handover, decreased incidences of adverse events, and enhanced safety.[5] The information exchanged via this handoff tool enables nurses to grasp comprehensive and systematic information in the quickest amount of time. Compared to SBAR, the ABCDEFP focuses more on patient information during the surgical process and doesn’t

include basic information or the patient's preoperative status. Therefore, the ABCDEFP should be used as an adjunct to other handoff tools rather than alone. Another 59-item checklist has been used to facilitate handoff. The contents of the checklist include three phases: preoperative (patient data, ASA class, medical history, allergies, medications), intraoperative (type of anesthesia, airway management, PONV prophylaxis, hemodynamics, antibiotic therapy, blood loss, drains, and pain management), and postoperative (important information pertaining to postoperative status).[14] This handover tool is intricately detailed, but the ample amount of information exchanged causes the length of this tool to be an inconvenience. Additionally, all items may not be applicable to all patients. Though there is some value to this tool, further studies are warranted to create a shorter handover checklist based on the preoperative, intraoperative, and postoperative framework.[14]

Ultimately, there is an increased variety in the handover process, and the wide availability of handoff tools presents another challenge to the standardization of the handover process. It is important to remember that different patients may require different handover patterns based on surgical type, hospital cultures, and other patient-specific details, which should all be considered when developing and adopting a handover tool.[15] Handover should be simplified and easily memorable to prevent the omission of information in the fast-paced PACU environment. A standardized handover tool is an essential component, along with clinician knowledge and sound judgment, to improve patient safety conditions.

Summary of Literature

A quality improvement project performed by Halterman et al.[2] sought to assess the advantages of incorporating a checklist in the post-anesthesia care unit (PACU) to mitigate the omission of crucial health information during the transition from anesthesia to PACU nursing.

Anonymous evaluations of patient handoffs from anesthesia providers were conducted by PACU nurses before and after the introduction of a handoff checklist following the Situation, Background, Assessment, Recommendation (SBAR) format.[2] PACU nurses documented the utilization of the handoff checklist and the inclusion of five specific health information items during both the preintervention and postintervention phases. The adoption of the checklist rose from 0% to 73%, correlating with a reduction in omitted information.[2] Completed handoffs surged from 13% to 82%, and checklist utilization remained consistently high, exceeding 79%, during the 12 weeks post-implementation.[2] The project successfully implemented a standardized checklist, aligning with the positive outcomes observed in the reviewed literature. Integrating a PACU handoff checklist enhances the transfer of care, ensuring that providers receive more pertinent medical information during these critical transitions.[2]

Lambert et al.[11] conducted a quality improvement project to test the Written Handoff Anesthesia Tool (WHAT). The Targeted Solutions Tool was utilized to identify deficiencies, causative factors, and specific patient data exclusions by senders of anesthesia handoffs before and after the introduction of the WHAT. The adequacy of the handoff process exhibited significant enhancements for CRNA to PACU handoffs. Following the implementation of the WHAT, satisfaction levels with anesthesia handoffs also significantly improved. Factors contributing to inadequate handoffs and omissions of patient details were recognized and notably improved. The implementation of the WHAT resulted in evidence-based modifications in practice, standardization, and enhanced communication during anesthesia handoffs.[11]

A study conducted by Halladay et al.[12] examined the implementation of a standardized electronic medical record (EMR) checklist to evaluate its effect on information transfer. A sample of 100 handoffs between anesthesia providers and Post anesthesia Care Unit (PACU)

nurses was observed prior to the implementation of the Electronic Medical Record (EMR)-based checklist, as well as at three weeks and three months post-implementation, resulting in a total of 300 observations. 40 anesthesia providers delivered PACU handoff reports to 30 PACU nurses. The introduction of a standard EMR-based PACU handoff tool led to a higher percentage of accurate and complete information being transferred between anesthesia providers and PACU nurses.[12] This improvement was attributed, in part, to the tool's capacity to prepopulate the electronic handoff checklist with patient data already available in the EMR.[12] Improvements were noted at both the 3-week and 3-month assessment intervals.

Njambi et al.[13] conducted a study in Melbourne, Australia, introducing a tool standardizing handoff between anesthetists and PACU nurses. The handoff tool was comprised of three elements. The first element was Connect, Observe, Listen, Delegate (COLD). The second was iSoBAR (Intirduction, Situation, Observation, Background, Assessment, and Recommendation).[13] The last was a 10-point checklist complementing the COLD process. The study determined that the implementation of this three element tool significantly improved behaviors to enhance patient safety. Nurses sought additional information to improve their patient care 37% more.[13] With the addition of the tool, nurses were empowered to identify gaps and inquire about additional information that helped them improve the care they were giving to their patients.

Canale[14] performed an evidence-based study implementing a handoff tool to improve patient safety, quality and transfer of information, and healthcare employee satisfaction. The study occurred at an 800-bed regional medical center in West Central Florida. A change team of twenty CRNAs were selected using nonprobability snowball sampling to create a Team Strategies to Enhance Performance and Patient Safety (TeamSTEPPS).[14] The team adopted their

version of the mnemonic PATIENT (Procedure/Patient, Anesthesia/Antibiotic/Airway/Allergies, Temperature, Invasive lines, $ETCO_2$/ventilation, Narcotics, Twitches) originally created by Wright, and implemented the tool for two weeks. Preintervention and postintervention data were compared using a paired *t test*. Results showed significant improvements in the transfer of information, patient safety, and employee satisfaction.[14]

A systematic review and meta-analysis conducted by Hu et al.[15] aimed to examine the correlation between intraoperative handovers and adverse outcomes in surgical patients. Adverse outcomes included mortality, morbidity, and any critical incidences occurring during anesthesia. The study concluded that each intraoperative handover increased the odds of delayed extubation by 44% and the odds of documentation errors by 52%, suggesting each additional handover increased the odds of morbidity.[15]

A meta-analysis performed by Lazzara et al.[16] analyzed 41 articles performing handoffs with a standardized protocol compared to handoffs that utilized no standardized protocol. The results demonstrated a notable positive shift in the transfer of handoff information following the adoption of a standardized handoff protocol. These findings suggest that most studies preferred standardized handoffs over non-standardized handoffs.

An unblinded cross-sectional study performed by Petrovic et al.[17] evaluated a perioperative handover protocol in the PACU. This study occurred at a tertiary care facility servicing 55,000 patients per year. During the preintervention phase, a trained observer collected data after observing 53 perioperative handoffs over the course of four weeks. A new protocol was implemented, and practitioners were provided with education regarding the new protocol. Two weeks after implementation, 50 more handoffs were observed, and practitioners were surveyed using the same process performed in the preintervention phase. Out of 103 handoffs,

the mean number of deficits per handoff decreased from 9.92% to 3.68%, and missed or omitted information decreased from 7.57% to 1.2%.[17] Thus, rendering a noted improvement in information sharing and reduced handoff deficits, with the implementation of a standardized handover protocol.

Lee et al.[18] developed an electronic handover checklist as an educational tool for anesthesia providers. The goal of this study was to enhance the transfer of care in a more thorough and complete way. A total of 68 handovers were observed. Providers were observed giving a handover with no handover tool, then again at a later date while utilizing a standardized checklist. The observer marked all items relayed during the handover at both intervals. Prior to use of the checklist, 54% of information was transcribed.[18] With use of the checklist, the information relayed increased to 98%. Providers were also asked to complete a questionnaire assessing their perception of the checklist and 100% of participants agreed that their handovers were significantly more accurate with the use of the checklist and would incorporate it into their daily practice.[18]

Saxena et al.[19] conducted a systematic review analyzing the current literature on perioperative checklists. Of the 25 studies included in this review, 23 (92%) determined a positive impact with the use of standardized checklists. Five (20%) studies noted a positive benefit in clinically relevant outcomes, while three (12%) studies reported that the use of checklists decreased perioperative mortality.[19] Additionally, two (8%) studies resulted in a decrease in perioperative complications. The review concluded the value anesthesia handover tools offer with respect to decreasing human error, enhancing team communication, and increasing the quality of care.[19]

Organizational Assessment

Project Goal

Anesthesia handoff creates an opportunity to exchange patient condition, care, treatment, medications, services, recent or anticipated changes, and other pertinent information relevant to providing safe, quality patient care.[3] The Joint Commission accentuates the value of effective handoff communication, placing much importance on identifying, implementing, and validating solutions that improve performance.[3] There is no standardized handover process at South Florida's leading level one trauma Medical Center. Evidence shows that standardization of handoff via forms, templates, checklists, mnemonics, and protocols ensures the accurate exchange of vital patient information and drastically increases the safety of post-operative patients. This project aims to improve the handover communication process at this facility by emphasizing teamwork, trust, an outline of clear roles and responsibilities, and setting an environment conducive to sharing patient information. Providing an opportunity for feedback and questions is also beneficial to the handover process.

The current anesthesia to PACU handover process consists of face-to-face patient identification and verification, and the anesthesia personnel translating patient care details via memory in no specific order. This process varies from provider to provider, and often, information is at risk of being left out. At this fast-paced trauma center, all charting is done via paper charting, and the anesthesia record is not excluded. The anesthesia record contains patient history, medications administered, allergies, positioning during surgery, IV access, and vital signs. Although the document contains the most relevant information pertinent to the intraoperative phase, all details are not included, nor is there space on the record for additional details. Furthermore, the information on the form follows no order, and even though much of it is there, it can be hard to decipher and subsequently transmit during a handoff. This facility could

benefit from implementing a structured and concise handoff tool, simplifying, standardizing, and improving the handover process.

Smart Goals and Outcomes

To close the gap between the current state of the handover process at this trauma center and the existing literature, the writer will use the method of SMART objectives. The SMART technique involves proposing a list of objectives that are specific, measurable, attainable, relevant, and time-based. This process aims to develop realistic and measurable outcomes to evaluate a program's goals and direct future activities. The overall long-term goals of this program are to improve the post-operative patient handover process, increase post-operative patient safety, decrease the omission of vital patient data, increase the receiving nurses' ability to care for the post-operative patient and increase employee satisfaction with the handover process.

To improve the post-op patient handover and decrease the omission of vital patient data, the SMART objective is to gain a 50% provider likelihood use of a standardized handoff tool by the end of the educational module. To increase post-operative patient safety, the SMART goal is to increase stakeholders' (anesthesia personnel) knowledge by 30% through an educational module detailing the benefits of handoff and the risks of the omission of information. A posttest will assess for the 30% knowledge increase immediately after employees have participated in the educational module, and the module will be presented to employees a minimum of three times to provide ample opportunity to participate. Handover compliance will be tracked for completeness and aligned with patient outcomes to measure whether the handoff tool increased patient safety.

The SMART goal that aligns with increasing the receiving nurse's ability to care for the post-operative patient will be to administer a pretest before initiation of the handoff tool. The pretest will assess provider confidence in caring for the post-operative patient in the current

climate. Ideally, after implementing a handoff tool for several weeks, a posttest will be administered to evaluate increased competency in providing post-op patient care. The goal is to obtain a 20% increase in confidence to provide safe patient care. The last goal, increased employee satisfaction with the handover process, will also be assessed via a survey before and after the initiation of the handover tool. The goal is to obtain a 20% increase in provider satisfaction with the handover process.

SWOT Analysis

Before implementing any program, the strengths, weaknesses, opportunities, and threats must be evaluated. A SWOT analysis aims to create a strategic plan to identify internal and external barriers and develop new ideas to overcome these barriers. This ensures the program's strength and ultimately leads to a solid and successful implementation.

Some strengths identified at the facility include a shared goal of excellence and considerable teamwork among providers. The trauma center’s employees are highly adaptable and knowledgeable, given the comprehensive patient population they care for.

A weakness identified includes the challenging environment at the trauma center. At this level 1 trauma center, things move at a fast pace, and the complexity of this environment may complicate the ability to adhere to a structured handoff protocol. When so many other things are being considered, a structured handoff may be overlooked in the rank of prioritization. Another area for improvement is the technology limitation placed on the anesthesia team. Anesthesia personnel is restricted to paper charting, while all other entities have access to electronic charting. Merging a standardized handoff tool under these circumstances may present a challenge.

Implementation of a handoff tool presents opportunities for improved patient safety and enhanced interdepartmental collaboration. Additionally, the accuracy and completeness of information transfer will increase. The likelihood of breaks in communication will be decreased. Overall, adding a handoff tool will promote a safer environment for patients and enhance the ability of providers to care for complex patients.

Threats to implementing this process include time limitations and workflow requirements in an acute level 1 trauma center. Additionally, staffing shortages may influence a lack of staff commitment to the project.

Quality Improvement Project

Settings and Participants

This project took place at a Trauma center in Fort Lauderdale, Florida. This hospital has serviced the community of South Florida for over 85 years, offering a wide variety of services, including level 1 trauma care. The medical center currently employs a diverse population of anesthesiologists and CRNAs. These providers offer anesthesia services throughout the hospital in any of the 19 operating rooms, 5-bed gastrointestinal suite, two-bed interventional radiology suite, and fully functioning labor unit. The anesthesiologists and CRNAs will be the primary research participants during the course of this project.

Approach

This project was implemented through an educational module provided to the anesthesia department at the level 1 trauma center. The educational module was formulated utilizing the research and guidelines obtained from the literature review pertaining to best practices regarding anesthesia handoff. Individuals completed a pre-survey rating their experience with the current postoperative patient handoff process. They were asked about the quality of handoff,

completeness, accuracy, relevancy, plan of care description, the opportunity to ask questions and provide feedback, and comfort level to provide thorough and complete patient handoff following the perioperative period. This data formed the basis for emphasizing the need to implement a standardized handover tool. The educational module was then presented to participants, outlining the importance of a high-quality handoff and its components. After the review of the educational module, an additional survey was administered to evaluate any changes in knowledge level pertaining to anesthesia handover and willingness to adopt a standardized handover protocol. This provided an opportunity to assess the receptiveness of the staff to participate in the use of a handover tool, as employee participation is an important component of this project's success. The follow-up survey also included an opportunity for participants to provide feedback and offer suggestions for later improvement.

Protection of Human subjects

Prior to any research, CITI training was completed, and a certificate of approval to research was obtained for all researchers. Participation was strictly voluntary, with no financial compensation. All participants were selected from an email list provided by the Florida International University faculty. Participants were invited to complete the survey in an electronic format via the emailed Qualtrics link. Anonymity was maintained throughout the entire process. Consent was obtained from every participant, and they received an explanation of the purpose and risks associated with their involvement. Their partaking in this project will bring about awareness, increased patient safety, and improved provider satisfaction with the handover process. There was minimal risk of harm associated with participation in this project. Providers may request to be withdrawn from the study at any time without penalty.

Data Collection

For the pre/post survey, providers will complete a questionnaire regarding a series of statements and questions regarding the trauma center's post-surgical patient handoff process and assessing the general knowledge level of handover. Some questions regarding years of specialty experience and longevity within the facility will be measured first. Other demographical questions included age, ethnicity, and gender. Then, a series of questions gauging providers' experience with the current handoff state was provided. Providers were asked to give a rating of "most likely to most unlikely" to statements delineating the quality, accuracy, completeness, and relevancy of the handoffs they have universally taken part in. The exact survey will be referenced in the appendices below. Once this data was evaluated, a short educational module presenting handover education and a handoff tool was shared with participants for a total of eight weeks. Post surveys were to be completed following the completion of the educational module, assessing the same factors: quality, accuracy, completeness, and relevance of handover. Some additional questions regarding provider satisfaction with handoff tools and their likelihood to implement the use of a handoff tool in their practice were also assessed.

Data Management

All data will be managed appropriately and according to the guidelines set forth by the International Review Board (IRB) throughout the lifespan of the project. Following project completion, results were assimilated, evaluated, and defined, then discarded appropriately to avoid risking any breach of confidentiality. HIPAA guidelines were followed, confidentiality was upheld, and no patient or personal identification was used to identify any of the participants or shared with any outside entities. Generalized results were shared with the faculty at Florida International University. All identities of the providers were protected, and all data remained anonymous.

Timeline

This project took place over the course of eight weeks. A thorough literature review was conducted prior to the assimilation of the project to include all relevant and available data regarding anesthesia handoff. CITI training took one week, and IRB approval took three weeks. An educational module was distributed to anesthesia personnel starting on June 5, 2023 and remained open until July 30, 2023. The module presented educational information regarding best practices of anesthesia handoff. The author assimilated a Qualtrics link containing the educational module and a pre-and post-test. This link was sent out to the medical center's employees anonymously, and all data collected during this time was recorded. Evaluation of the effectiveness of the educational module, handoff quality, and patient safety continues to be ongoing.

Results

The survey was distributed a total of three times between June 5, 2023, and July 16, 2023. It remained open and available for respondents to complete until July 30, 2023. Out of the 43 emailed requests, four responses were completed in their entirety. Male participants accounted for 25% (n=1), and female participants accounted for 75% (n=3). 50% of participants were Hispanic, while 25% were African American, and 25% identified as other ethnicity. 75% of participants were doctoral-level CRNAs with 1-2 years of experience, and 25% were masters-level CRNAs with 1-2 year of experience. Participant demographics are outlined in Table 1, listed below.

Table 1: Participant Demographics

	N	**%**
Total Participants	4	100%
Gender		

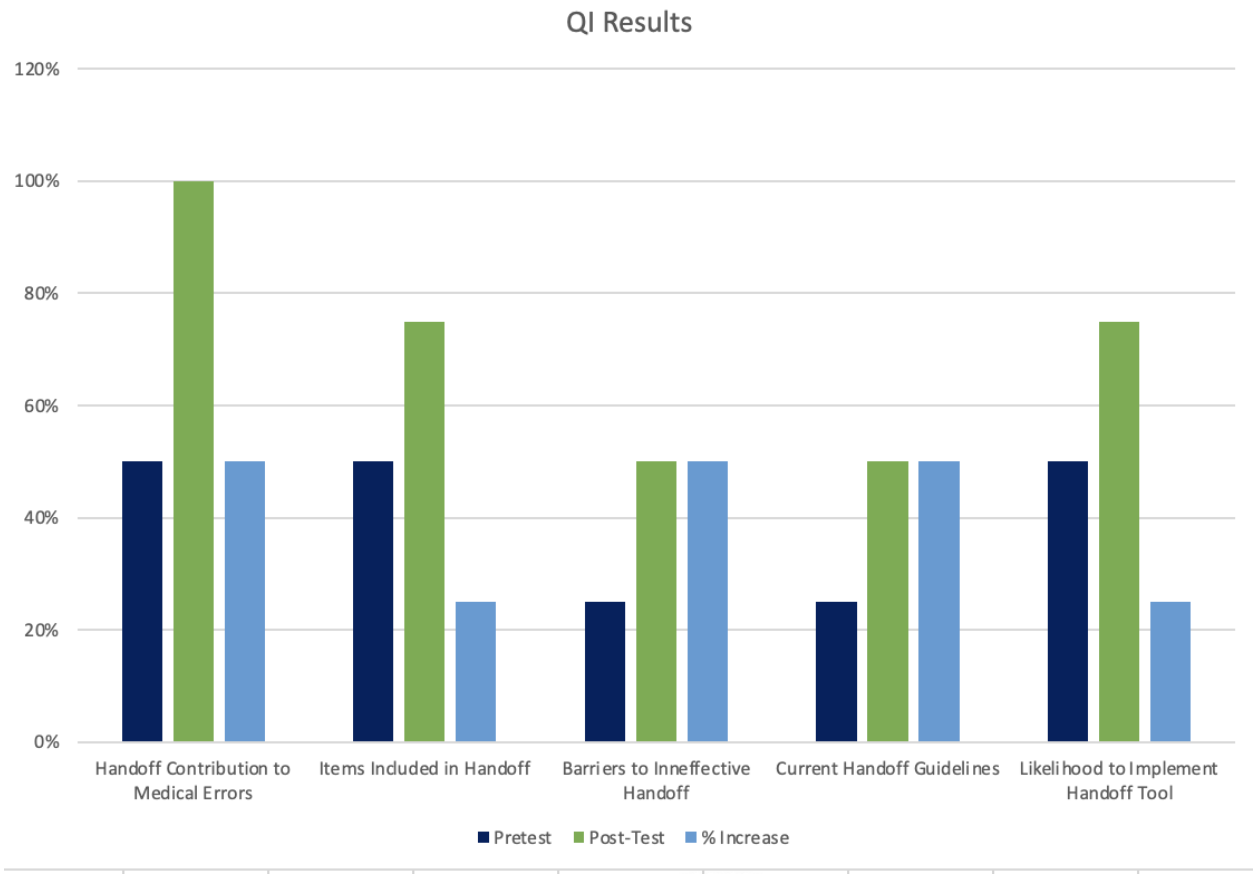
Male	1	25%
Female	3	75%
Ethnicity		
Hispanic	2	50%
Caucasian	0	0%
African American	1	25%
Asian	0	0%
Other	1	25%
Level of Education		
Master's	1	25%
Doctorate	3	75%
Certificate	0	0%
Experience		
1-2 years	4	100%
2-5 years	0	0%
5-10 years	0	0%
10 or more years	0	0%

The results of the pre-test and post-test are listed below in Tables 2 and 3. When comparing the results of both surveys, the educational module yielded favorable results. There was a 50% discernible increase in knowledge in 3 out of 10 categories and a 25% increase in knowledge in 1 out of 10 categories. In the pre-survey, one respondent was initially extremely unlikely to implement a standardized handoff to their practice, but by the end of the educational module, this participant selected that they were extremely likely to implement a standardized handoff to their practice, offering a 25% increase in provider likelihood of use. Overall, the educational module demonstrated effectiveness by enhancing provider knowledge and increasing their receptiveness and likelihood of utilizing a handoff tool.

Table 2: Survey Results

Question	Pretest	Posttest	Difference
1. Communication breakdown and ineffective handoff contributes to what percentage of critical medical errors	50%	100%	50%
2. All of the following should be included in a handoff except:	50%	75%	25%
3. Transmission of information from CRNA to PACU RN is all that is required for a successful handover to take place	75%	75%	-
4. What barriers contribute to ineffective handoff?	25%	50%	50%
5. All of the following can be used to standardize handoff except	50%	50%	-
6. To date, handoffs are standardized, and there is no variation in the structure of report or information given	25%	50%	50%
7. How likely are you to utilize a structured handoff tool during anesthesia handoff	50%	75%	25%
8. When I provide handoff, I feel it is accurate and complete	100%	100%	-
9. Standardized handover decreases the likelihood for breaks in communication	100%	100%	-
10. Implementation of a handoff tool presents opportunities for improved patient safety and enhanced interdepartmental collaboration	100%	100%	-

Table 3: QI Results



Discussion

To implement this quality improvement project, several steps need to be taken and variables considered to sustain the change. Now that a thorough assessment of the current handover process has been completed and strengths and weaknesses have been identified, it is critical to create specific objectives designed to improve the handover process. These include reduction in communication errors, enhancing team collaboration, ensuring completeness of information transfer, and improving patient safety.[16] Appointment of a multidisciplinary team involving anesthesiologists, nurse anesthetists, and any other relevant healthcare professionals can also help to implement and sustain this change. This team will be dedicated to the quality

improvement process and should include representatives from different shifts and experience levels. After assessing the current handover process and reviewing the above relevant data, this team will agree on a handover protocol that includes all essential elements pertaining to the perioperative process and post-anesthesia care. The agreed-upon protocol should be concise, easy to follow, and easily adaptable to various clinical scenarios. The appointed representatives will be responsible for providing in-services and training on the new protocol before its official launch. Once the protocol has been launched, the team will continue to assess the handover process, keep track of relevant data, and consider feedback from all members of the healthcare team. Feedback will be continuously used to evaluate the protocol and make adjustments as necessary.

Conclusion

A multitude of factors contribute to patient safety, and it is the one element of patient care in which there is always room for improvement. Handover is a critical component in ensuring patient safety is protected.[17] Collaboration between the outgoing and receiving provider enables the receiving provider to optimize patient management and decision-making based on the elements that have been reported by the outgoing provider.[18] This is an opportunity for the current provider to share recommendations for continued care and enlighten the receiving provider with their expertise specific to the patient's needs. A thorough handover process reduces the risk of errors and adverse events. Clear communication during the transfer of care is essential to a seamless transition for the patient. A standardized handover tool sets the stage for a well-structured handover process to ensue, thus making it a valuable tool to employ at this trauma center. Based on the feedback received, the anesthesia providers are in full support of endorsing a handover tool and offer their cooperation should a protocol be adapted. Limitations to this

study include a small sample size and limited cooperation. If this project were to be completed again, one change would be to set aside a designated time to present the educational module in person. Asking employees to complete surveys on their own time was convenient but not as engaging and did not yield full cooperation. Only two survey responses were received. Based on the response, implications for practice include the implementation of a handover tool. A standard and structure are valuable tools that add to patient safety and decrease the risk of omission of information.[19] In conclusion, improving the handover process at this medical center has promising potential and could greatly improve patient safety and staff satisfaction.

Citation	Design/ Method	Sample/ Setting	Major Variables Studied and Their Definitions	Measurement And Data Analysis	Findings	Results	Conclusions	Appraisal: Worth to Practice/Level
Halterman RS, et al.,[2] 2019	Experimental design in which patient handoffs from anesthesia providers were anonymously assessed by PACU nurses before and after the implementation of a handoff checklist with the Situation, Background, Assessment, Recommendation format. PACU nurses recorded use of the handoff checklist and if five items of health information were included in the handoff during the preintervention and postintervention phase.	This project was conducted at a 478-bed level I trauma health center. The anesthesia department consists of 22 anesthesiologists, 30 Certified Registered Nurse Anesthetists (CRNAs), 37 resident anesthesiologists, whereas the PACU consisted of 20 registered nurses. An interdisciplinary committee consisting of four PACU nurses, two CRNAs, two anesthesiologists, two resident anesthesiologists, and three QI nurses was formed.	The three key compliance rates explored in this project were PACU SBAR handoff tool use, the omission of critical information in handoffs, and the percentage of complete reports given. Each of these was tracked using the handoff assessment form.	PACU nurses collected the data on the completion of the handoff. he anesthesia providers were blinded of the data collection. These data, collected by the PACU nurses, were assessed for its completion after the fact. Two weeks after the intervention and education was provided, data were again collected for one full week.	The postintervention data showed a marked decrease in omissions of data; from 19.2% to 2.2% for procedure, 23.1% to 4.5% for allergies, 16.7% to 0% for input and output, 21.8% to 4.5% for antiemetic administration, and 19.2% to 11% for lines and catheters.	The number of complete reports also increased greatly with a change from 13% preintervention to 82% postintervention.	The use of a standardized checklist has been shown to improve the information transferred during handoff from one provider to another. The goal of this project was to improve knowledge transfer and decrease omissions during the handoff period between the anesthesia staff and PACU staff. The project was successful in implementing a standardized checklist.	Level I randomized explanatory mixed methods design that allowed the group to review data and provide recommendations based on results. Projected costs were minimal and included printing forms as well as education and lecture materials. The most significant potential barrier identified was the perception of additional work because of the formal handoff checklist.

Lambert LH, et al.,[11] 2018	A quantitative preintervention postintervention design was used for this quality improvement project to test the WHAT	350-bed hospital in the Southeastern United States. The study population consisted of 22 CRNAs and 15 PACU RNs. Sampling was by convenience. All CRNAs and PACU RNs were included in the implementation of the WHAT as well as the pre- and post data collection using the TST forms.	The major variables were adequacy, contributing factors, and incomplete information	For this study, the TST was used to determine whether anesthesia handoffs were perceived as adequate and to identify the factors contributing to inadequate handoffs and patient details omitted	Standardization has resulted in improved adequacy of anesthesia handoff	The use of a written tool significantly improved the adequacy and completeness of anesthesia handoff communication	The WHAT, adopted by CRNAs, contributed to standardization, significantly improved anesthesia handoff communication, and led to an evidence-based change in practice	The limitations of this study included a sample of convenience, the use of one facility, and a possible Hawthorne effect from participants' awareness of being evaluated

Halladay ML, et al.,[12] 2019	A pre-implementation and post-implementation design was used to evaluate the completeness and accuracy of information transfer during anesthesia to PACU handoffs in a convenience sample of surgical patients	Thirty individual PACU nurses were observed participating in handoffs during the observation periods. Forty anesthesia providers were observed providing 300 PACU handoff reports to 30 PACU 1 and PACU 2 nurses.	The variables in this study are a standardized PACU handoff checklist and information transferred from anesthesia providers to PACU nurses during the handoff.	A convenience sample of 100 handoffs between anesthesia providers and PACU nurses was observed by the same observer before implementation of the EMR-based checklist, and 3 weeks and 3 months postimplementation for a total of 300 observations.	All but 1 of the 21 handoff checklist items were accurately addressed to a greater percentage at the 3 weeks and 3 months' time periods in the PACU 1 and PACU 2 compared with preimplementation baseline after standardization of the handoff process	A greater percentage of complete accurate information was transferred between anesthesia providers and PACU nurses as a result of implementing a standard EMR-based PACU handoff tool. This was partly because of the capability to prepopulate the electronic handoff checklist with patient data already available in the EMR. This capability also minimized the time it took anesthesia providers to generate the checklist	A standardized EMR-based anesthesia to PACU handoff checklist produced an increase in the quantity and accuracy of the information transferred during the PACU handoff, decreased the duration of the verbal handoff interchange, and ultimately increased the PACU nurses' satisfaction with some components of the handoff process in the institution where it was implemented	There was no ''control'' condition, therefore the improvement in the total numbers of items addressed and their accuracy may simply be because of the presence of an observer or some other unknown external factor. A within subjects' design was not used and the changes in responses to the survey items preimplementation and postimplementation of the EMR-based handoff checklist may be attributed to observing and surveying different providers.

Njambi M, et al., [13] 2021	This pre- and post-design study explored the feasibility and acceptability of a brief patient safety intervention to introduce a tool to standardize inter-disciplinary communication processes at patient handoff between anesthetists and post anesthesia nurses in the postanesthetic care unit.	Observation and interview data were collected pre- and post-intervention from a convenience sample of 27 nurses and 23 anesthetists in a large tertiary hospital	The variables of this study are the standardized PACU handoff tool, and nurse interactive communication behaviors during interprofessional PACU handoff before and after introducing the tool	Behaviors captured using the observation tool were coded as observed or not observed and frequencies calculated. Quantitative data were analyzed using IBM SPSS Statistics (Version 23) including descriptive and reliability analyses. Qualitative data were subjected to a six-step process for analysis	This study found introduction of the standardized handoff tool significantly improved behaviors to enhance patient safety	A significant difference for five of the desired handoff behaviors included in the PACU handoff tool indicated they were more frequent in Phase 2, hence, adopted by nurses.	In this study a brief intervention to introduce a tool to standardize PACU handoff processes improved nurse experience, and nurse handoff behaviors related to patient identification and identification of allergies, consistent with advocating for patient safety. The change in behavior combined with a higher satisfaction rating when the tools were used demonstrated improvement in nurse experience of handoff suggesting acceptability and feasibility of using the four-step COLD process in this PACU setting.	Limitations of this study include the convenience nature of the sample, and the study being conducted at a single site

Canale ML, [14] 2018	A prospective randomized controlled trial of 120 post-anesthesia handoffs. This EBP quality improvement project used a pretest/ posttest quality improvement design. It follows The Johns Hopkins EBP model and guidelines	The project consisted of 20 CRNAs involved in the transfer of care of anesthetized patients in the perioperative department of an 800-bed regional medical center in West Central Florida. This project used purposive, non-probability, snowball sampling from a convenience sample of CRNAs to create a "change team." Early adopters, innovators, laggards, and potential nay-sayers were specifically selected	Standardized handoff procedure for the transfer of care of perioperative patients; goals of improving the quality and continuity of the transfer of information, enhancing patient safety, and increasing healthcare worker satisfaction	The preintervention survey consisted of 1 categorical question, 5 multiple-choice items, and 3 open-ended questions. Items were modified to more closely address the indicators of this project: continuity and quality of transfer of information, perioperative staff satisfaction, and perioperative staff perception of patent safety. The postintervention survey contained 3 categorical items, including 2 demographic questions, 5 multiple-choice items, and 3 open-ended questions.	Analysis of a paired *t* test indicates statistically significant improvement when comparing participants' pre- and postintervention handoff procedures. This analysis demonstrated that the greatest improvements achieved by the change team were related to the number of standardized handoffs performed and whether the CRNA believed that the handoff process lent itself to mistakes. Improvements in these areas indicate that this project was successful in making a significantly positive change in behavior and attitude surrounding the transfer of care of patients.	Analysis of a paired *t* test indicated statistically significant improvement when participants' preintervention (non-standardized) handoff procedure was compared with the postintervention standardized procedure in the following areas: number of standardized handoffs performed, satisfaction with the transfer process, appropriateness of the handoff process, whether the handoff lends itself to mistakes, whether the handoff process is comprehensive, and whether the handoff provided for effective transfer of important information. A descriptive analysis was also performed to compare preintervention survey data with postintervention survey data. These data demonstrated improvement in all categories	This EBP quality improvement project demonstrates that the quality of transfer of information, perceptions of patient safety, and healthcare worker satisfaction improved, and adherence to the current clinical guidelines provided by the AORN, The Joint Commission, and the DoD PSP were achieved through implementation of a standardized handoff procedure.	Limitations in the literature include few studies specific to the transfer of care of the anesthetized patient; however, there is reasonable transferability of the evidence regarding the standardization of handoff procedures, which can be applied to all perioperative patients.

Hu J, et al., [15] 2020	systematic review and meta-analysis	The final sample comprised seven retrospective cohort studies. The total sample size across the studies was 680,155, ranging from 927 to 313,066. All the participants were adult patients receiving general anesthesia. Among these partici-pants, 139,362 patients (20.49%) had anesthesia handovers during their surgeries.	Anesthesia handover, Adverse outcomes (mortality, postoperative morbidity, and any critical incidences that may have happened during anesthesia delivery)	The methodological quality of each included study was assessed using the Newcastle-Ottawa Scale (NOS), which included cohort studies or case-control studies.22 In the NOS, a total of eight items are evaluated, including participant selection, comparability of cohort/case-control on the basis of the design or analysis, and exposure (case-control studies)/study outcome (cohort studies).	The systematic review and meta-analysis provided empirical evidence that intraoperative anesthesia handover may contribute to patient adverse outcomes	Five different collapsed adverse outcomes (any vs none) were studied in these seven studies, including composite of mortality and morbidity, in-hospital mortality, composite of postoperative morbidity, delayed extubation, and documentation errors of controlled medication. All seven studies achieved a high score rating (eight stars) ac-cording to the NOS.	Each additional intraoperative patient handover between anesthesia providers increased the odds of composite morbidity but not the odds of composite mortality and morbidity or in-hospital mortality.	The strength of the systematic review is the generalization of research findings, as the included studies involved different populations undergoing various surgeries. However, the meta-analyses found considerable statistical heterogeneity. This limitation could influence the validity of the meta-analysis results.

Lazzara EH, et al.[16] 2022	Meta-analyses	41 articles with post-operative anesthesia handoffs that implemented a standardized handoff protocol.	Effects of post-operative anesthesia handoff standardization on provider, patient, organizational, and handoff outcomes.	Based upon the Campbell collaboration best practices in meta-analyses we converted mean difference effects to odds ratios to minimize loss of information in our transformations. I^2 was used to test for statistical heterogeneity. A high heterogeneity, where $I^2 > 75\%$, indicates that there is a large difference in studies not due to chance in either the clinical context or statistical context	Standardization could be beneficial. It serves as a guide for novices, reduces unwanted variability, mitigates memory lapses, and serves as an unbiased authority. Even though these are potential advantages of standardization, standardization is not necessarily exclusively beneficial. Standardization, in practice, is often about compliance, not quality, minimizes or eliminates wanted variability, and has the potential to introduce unnecessary information or interventions.	Overall, post-operative provider outcomes showed significant change in the positive direction with the use of a standardized handoff as compared to not using one Overall, patient outcomes were significantly more positive after the implementation of a standardized handoff approach All studies did show a significant positive effect after the implementation of a standardized handoff approach	Overall, our meta-analyses suggest that the implementation of standardized post-operative anesthesia handoffs leads to positive effects on a variety of outcomes (i.e. provider, patient, organizational, and handoff outcomes).	Most research has focused on post-operative anesthesia handoffs. That is, no studies that could be meta-analyzed have investigated pre-operative anesthesia handoff protocols, and few have examined intraoperative handoffs. Although it is reassuring that much work regarding post-operative handoffs is being conducted, pre-operative and intraoperative handoffs are also important.

Petrovic MA, et al.,[17] 2015	Prospective, unblinded cross-sectional study.	Peri anesthesia care unit in a tertiary care facility; 103 surgery patients	Standardized handoff and the number of perioperative communication errors and technology transfer defects	Type of information shared, type and duration of procedure, total duration of handoff, number and type of providers at the bedside, number of report interruptions, environmental distractions, and any other disruptive events. Observers also tracked technical/equipment problems to include malfunctioning or compromised operation of medical equipment, such as the cardiac monitor, transducer, oxygen tank, and pulse oximeter.	The most frequently missed items from the anesthesia report included baseline physical examination findings, baseline labs, and allergies. Communication gaps have been shown to ultimately result in patient harm either through inefficiency or suboptimal management	The mean number of defects per handoff decreased from 9.92 to 3.68 ($P < .01$). The mean number of missed information items from the surgery report decreased from 7.57 to 1.2 items per handoff and from 2.02 to 0.94 ($P < .01$) for the anesthesia report. Technical defects reported by unit nurses decreased from 0.34 to 0.10 ($P = .04$). Verbal reports delivered by surgeons increased from 21.2% to 83.3%. Although the mean duration of handoffs increased by 2 minutes ($P = .01$), the average time from patient arrival at PACU to handoff start was reduced by 1.5 minutes ($P = .01$). Satisfaction with the handoff improved significantly among PACU nurses.	The perioperative handoff protocol implementation was associated with improved information sharing and reduced handoff defects.	Standardizing a process can give users a false sense of security that, if they simply follow the algorithmic steps, they will have successfully completed the process. The user may become so focused on completing all the steps of the process that the overarching concept of relaying what is most important becomes lost. In addition, receivers of information from standardized processes may subserve their abilities as critical thinkers to trying to "capture" all of the information being relayed. Standardization provides an important framework for providing information in a consistent manner but should never replace the actual act of critical thinking and questioning.

Lee SC, et al.,[18] 2019	Pre and post intervention design	Thirty-four anesthesia trainees	Anesthesia handoff checklist, handover efficiency, communication skills	Anesthesia trainees were observed giving an intraoperative handover without the checklist, and then again with the checklist at a later time. An observational handover assessment tool was used by investigators to mark each item as either spontaneously relayed by the giver, elicited by the receiver, not discussed or not applicable to the case. After the use of the checklist, each handover giver filled out a survey related to his or her perceptions of the checklist.	With the intervention of the checklist, our results show that the use of a standardized intraoperative checklist improved the transfer of important patient information among anesthesia trainees.	The proportion of items spontaneously relayed increased from 54% without the checklist to 98% when using the checklist ($p < 0.0001$). More than 90% of participants felt that the check- list increased handover efficiency and communication skills. All participants stated that the handovers were more thorough with the checklist and that they would incorporate it into their daily practice.	Although we saw a significant improvement to 98% of information transferred with the initial use of the checklist by the trainee, more practice and periodic evaluation may help learners to achieve 100% of information transfer.	Observer bias and observer effect were two possible limitations in this study. Although a standardized handover assessment tool was used to check for objective end points, there is a possibility that responses were interpreted more favorably if there was ambiguity.

Saxena S, et al., [19] 2020	systematic review	25 articles were included in this review. In order for an article to be selected, the study had to meet the following inclusion criteria: (1) be a prospective study (controlled or uncontrolled, randomized or observational), (2) be conducted in live patients or a simulation setting, and (3) study the impact of anesthesia-specific checklists on patients or providers.	Anesthesia checklists and perioperative mortality, complications, and process improvement measures.	Data extraction included the type of study, the patient population, the type of checklist investigated, all available results (e.g. differences between pre and post-task checklists, differences between groups being studied, and any other relevant data), the effect sizes, and the *P* values when available.	An overall improvement in information exchanged between care providers was indeed documented in many studies	Overall, a positive impact of the use of checklists was found in 23 (92%) of the 25 studies included in this review. Five (20%) studies reported a benefit on clinically relevant outcomes. Specifically, 3 studies (12%) reported a decrease in perioperative mortality related to the use of checklists, and two studies (8%) reported a decrease in perioperative complications	Anesthesia-specific checklists have the ability to decrease human error, improve team communication and increase quality of care. anesthesia-specific checklists have been shown to be useful for provider handoffs, emergencies, and routine anesthesia procedures	This systemic review also accentuates the lack of existence of a standardized study design to evaluate the clinical impact of anesthesia checklists. However, more large-scale studies are necessary to identify an ideal anesthesia checklist and its most appropriate implementation method.

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APPENDICES

APPENDIX A: IRB Approval Letter

FIU | Research & Economic Development
FLORIDA INTERNATIONAL UNIVERSITY

MEMORANDUM

To: Dr. Vicente Gonzalez

CC: Callesha Wright

From: Carrie Bassols, BA, IRB Coordinator Ceb

Date: March 21, 2023

Proposal Title: "Anesthesia Handoff: A Quality Improvement Project"

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-23-0127 **IRB Exemption Date:** 03/21/23
TOPAZ Reference #: 112811

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 B: Letter of Support from Faculty

ANESCO™
Driving Results in Anesthesia

February 7, 2023

Vince Gonzalez, DNP, CRNA, APRN
Clinical Assistant Professor
Department of Nurse Anesthesiology
Florida International University

Dr. Gonzalez,

Thank you for inviting Broward Health Medical Center to participate in the Doctor of Nursing Practice (DNP) project conducted by Callesha Wright, entitled "Anesthesia Handoff: A Quality Improvement Project" in 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 regarding the dangers associated with incomplete or inadequate post-anesthesia handoff reports.

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 any time. 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: Callesha Wright and Vicente Gonzalez

Once the Institutional Review Board's approval is achieved, this scholarly project's execution will occur over two weeks. Callesha Wright 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.

2/9/23

Edward Punzalan, DNP, CRNA, APRN — Date
Administrative Director of Nurse Anesthesia
Healthcare Performance Anesco

APPENDIX C: Recruitment Letter

FIU Department of Nurse Anesthesiology

Nicole Wertheim College of Nursing & Health Sciences

Anesthesia Handoff: A Quality Improvement Project

Dear Anesco Perioperative Providers:

My name is Callesha Wright, 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 on the dangers of giving or receiving an inadequate handoff and the benefit to implementing a structured handover tool. You are eligible to take part in this project because you are a part of the Anesco perioperative providers.

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 pre-test questionnaire, which is expected to take approximately 5 minutes. You will then be asked to view an approximately 10 minutes long educational presentation online. After going through the educational module, you will be asked to complete the post-test 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 at Callesha Wright, 678-680-2500, cwrig065@fiu.edu.

Thank you very much.

Sincerely,

Callesha Wright, 678-680-2500, cwrig065@fiu.edu

APPENDIX D: IRB CONSENT FORM

FIU | FLORIDA INTERNATIONAL UNIVERSITY

CONSENT TO PARTICIPATE IN A QUALITY IMPROVEMENT PROJECT

Anesthesia Handoff: A Quality Improvement Project

SUMMARY INFORMATION
Things you should know about this study:

- **Purpose:** Educational module to increase providers awareness of Anesthesia Handoff
- **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 Anesthesia handoff
- **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 10 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 increase providers' knowledge on the potential dangers of giving or receiving an inadequate or incomplete post anesthesia handoff. If you decide to participate, you will be 1 of 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 pre-test 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 post-test 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: increased participant knowledge on the risk of incomplete handoff, improvement in anesthesia handoff procedures, increased employee satisfaction, and increased patient safety. 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 Callesha Wright at 678-680-2500/ cwrig065@fiu.edu and Vince Gonzalez at gonzalv@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 E: Pre and Post-Test Questionnaire

Pretest and Posttest Questionnaire:

Anesthesia Handoff: A Quality Improvement Project

INTRODUCTION

The primary aim of this QI project is to increase providers' awareness of the anesthesia handover process, improve patient safety, and increase employee satisfaction

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 on anesthesia handoff

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 PACU RN
5. **Level of Education:** Certificate Bachelors Masters DNP PhD
6. How many years have you been a perioperative provider?

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

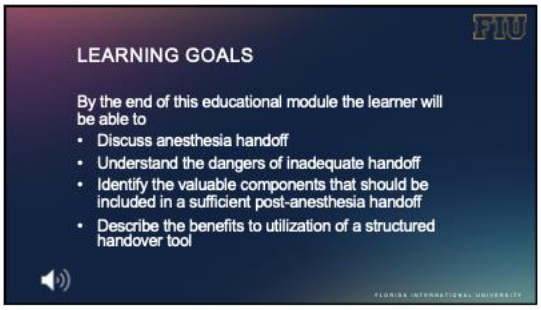
QUESTIONNAIRE

1. **Communication breakdown and ineffective handoff contributes to what percentage of critical medical errors:**
    a. 80%
    b. 30%
    c. 50%
    d. 10%
2. **All of the following should be included in a handoff except:**
    a. Pertinent medical history
    b. Allergies
    c. Hemodynamic status
    d. Physical assessment findings
    e. Length of surgical procedure
3. **Transmission of information from CRNA to PACU RN is all that is required for a successful handover to take place:**
    a. True
    b. False
4. **What barriers contribute to ineffective handoff? (Select 3)**
    a. Chaotic PACU environment with frequent interruptions
    b. Staffing shortages
    c. Fatigue
    d. Inadequate time/production pressure
    e. Critical patient condition

5. **All of the following can be used to standardize handoff except:**
    - **a.** Checklists
    - **b.** Templates
    - **c.** Mnemonics
    - d. Labels
6. **To date, handoffs are standardized, and there is no variation in the structure of report or information given.**
    - **a.** True or False
7. **How likely are you to utilize a structured handoff tool during anesthesia handoff?**
    - a. Most likely
    - b. Somewhat likely
    - c. Somewhat unlikely
    - d. Most unlikely
8. **When I provide handoff, I feel it is accurate and complete**
    - a. Most likely
    - b. Somewhat likely
    - c. Somewhat unlikely
    - d. Most unlikely
9. **Standardized handover decreases the likelihood for breaks in communication**
    - **a. True or false**
10. **Implementation of a handoff tool presents opportunities for improved patient safety and enhanced interdepartmental collaboration**
    - **a. True or false**

APPENDIX F: Educational Module

1



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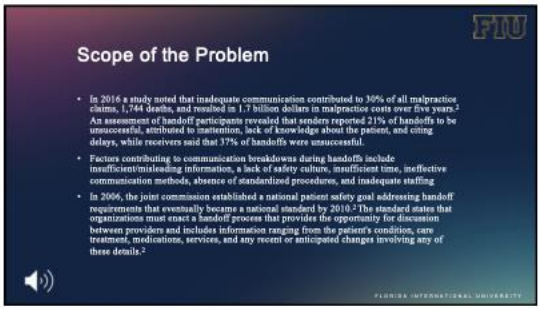

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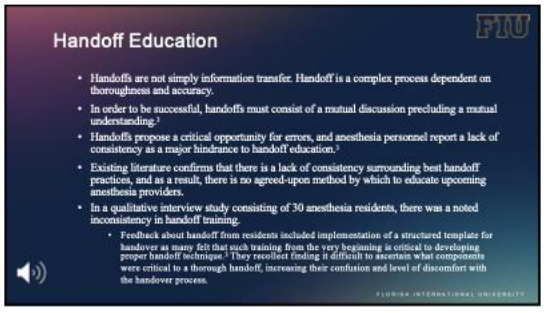

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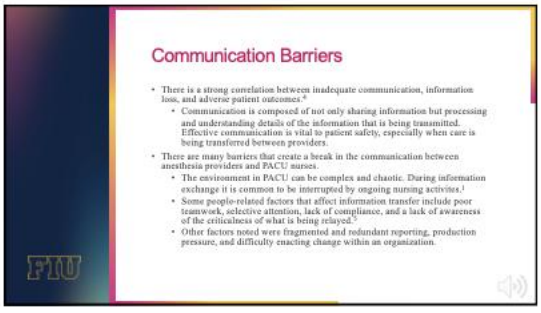

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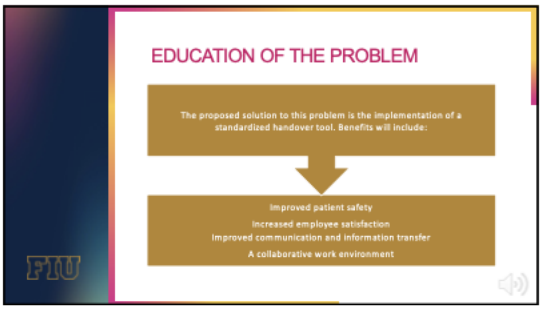
EDUCATION OF THE PROBLEM
The proposed solution to this problem is the implementation of a standardized handover tool. Benefits will include:
Improved patient safety
Increased employee satisfaction
Improved communication and information transfer
A collaborative work environment
FIU

7


FIU
Significance
Evidence shows that standardization of handoff via forms, templates, checklists, mnemonics, and protocols ensures the accurate exchange of vital patient information and drastically increases the safety of post-operative patients.
The Joint commission accentuates the value of effective handoff communication, placing much importance on identifying, implementing, and validating solutions that improve performance.
This project aims to improve the handover communication process by emphasizing teamwork, trust, an outline of clear roles and responsibilities, and setting an environment conducive to sharing patient information.

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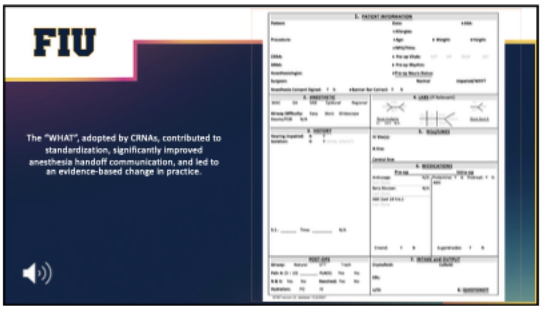
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The "WHAT", adopted by CRNAs, contributed to standardization, significantly improved anesthesia handoff communication, and led to an evidence-based change in practice.

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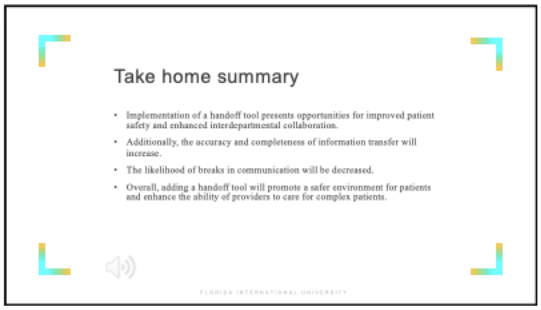
Take home summary
Implementation of a handoff tool presents opportunities for improved patient safety and enhanced interdepartmental collaboration.
Additionally, the accuracy and completeness of information transfer will increase.
The likelihood of breaks in communication will be decreased.
Overall, adding a handoff tool will promote a safer environment for patients and enhance the ability of providers to care for complex patients.

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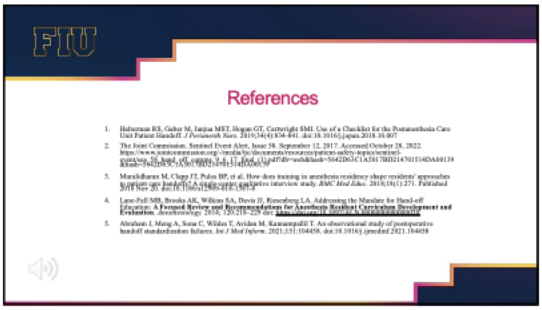
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APPENDIX G: Symposium Presentation

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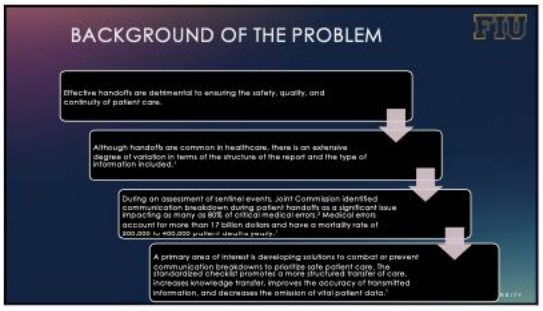

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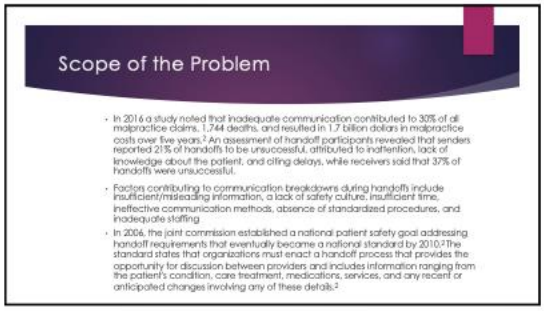

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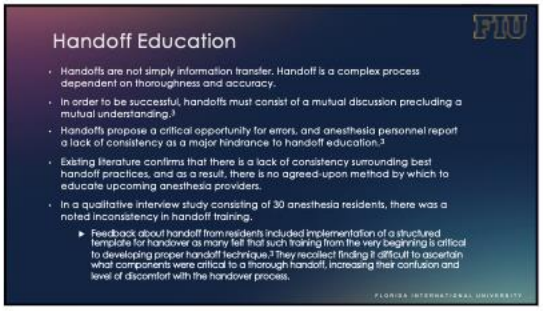

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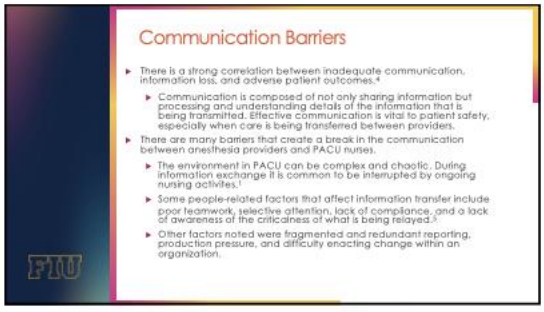

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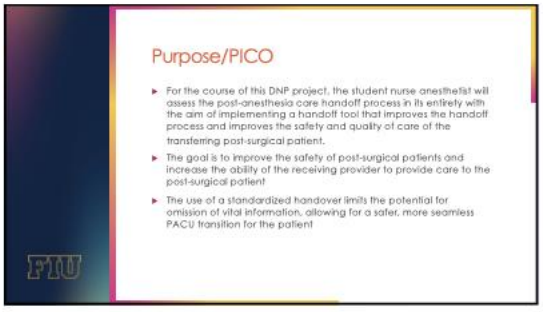

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QI Methods

- This project took place at a trauma center in south Florida that employs a mixture of anesthesiologists and certified registered nurse anesthetists. These are the primary research participants.
- They were asked about the quality of handoff, completeness, accuracy, relevancy, and plan of care description
- They received an educational module outlining the importance of a high-quality handoff and its components
- The author assimilated a Qualtrics link consisting of an educational module and a pre-and post-test.
- For the pre/post survey, providers completed a 5-point Likert scale regarding a series of statements and questions regarding the trauma center's post-surgical patient handoff process. Generalized handover knowledge was also assessed.

7

QI Results

The survey was distributed a total of three times between June 5, 2023, and July 30, 2023.

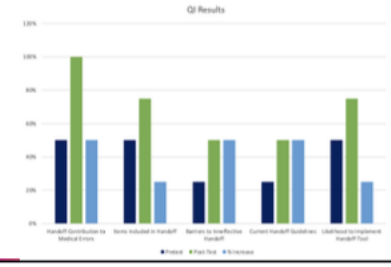
Out of the 43 emailed requests, four responses were completed in their entirety.

Demographics:

- 25% male, 75% female
- 50% Hispanic, 25% African American, 25% other
- 25% master's degree, 75% doctoral degree
- 100% of participants have 1-2 years of experience

8

QI Results



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QI Results

- 50% increase in knowledge in 3 out of 10 categories assessed
  - Ineffective handoff contribution to medical errors
  - Barriers to ineffective handoff
  - Current handover guidelines
- 25% increase in knowledge in 1 out of 10 categories assess
  - Factors warranting mandatory inclusion in handoff
- 25% increase in provider likelihood of use
- 75% of the surveyed anesthesia providers have expressed their interest in this endeavor for improved patient safety, and 75% have expressed their willingness to implement the use of this tool in their day-to-day practice.

10

Discussion

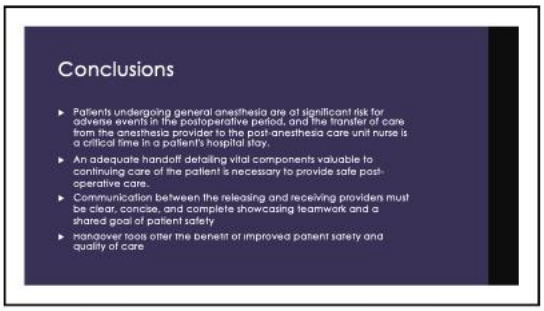
- Handover is a critical component in ensuring patient safety is protected.
- A thorough handover process reduces the risk of errors and adverse events.
- Clear communication during the transfer of care is essential to a seamless transition for the patient.
- A standardized handover tool sets the stage for a well-structured handover process to ensue, thus making it a valuable tool to employ at this trauma center.
- Based on the feedback received, the anesthesia providers support endorsing a handover tool and offer their cooperation should a protocol be adopted.
- Limitations to this study include a small sample size, as only four questionnaires were completed.

11

Discussion

- Steps to implementing this quality improvement include:
  - Appointment of a multidisciplinary team
    - Anesthesiologists, CRNAs, PACU RNs
  - Perform an assessment of the current handover process, identifying strengths and weaknesses
  - Create specific objectives to improve weaknesses and maintain strengths
    - Improved patient safety, reduction in communication errors, enhanced team collaboration
  - Create/implement a handover tool that addresses goals
  - Provide employees with training on the new protocol
  - Track changes and continuously evaluate and make necessary adjustments

12


Conclusions
Patients undergoing general anesthesia are at significant risk for adverse events in the postoperative period, and the transfer of care from the anesthesia provider to the post-anesthesia care unit nurse is a critical time in a patient's hospital stay.
An adequate handoff detailing vital components valuable to continuing care of the patient is necessary to provide safe post-operative care.
Communication between the releasing and receiving providers must be clear, concise, and complete showcasing teamwork and a shared goal of patient safety
Handover tools offer the benefit of improved patient safety and quality of care

13


Thank You
THANK YOU FOR YOUR PARTICIPATION, I HOPE YOU ENJOYED THIS PRESENTATION.

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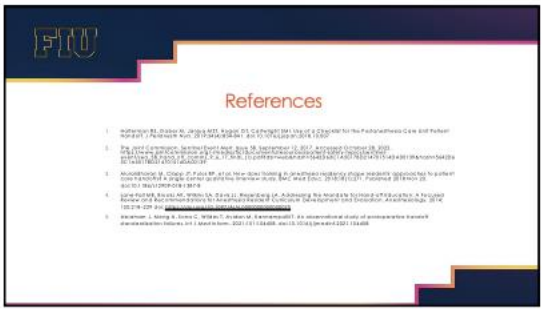
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References

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