Assessing Anesthesia and Post Anesthesia Care Unit Perceptions of Adequacy of a Patient Care Handoff Tool: A Doctor of Nursing Practice Project

Reagan V. Atkins, BSN, SRNA

Maura McAuliffe, PhD, CRNA, FAAN, Project Chair

Nurse Anesthesia Program

College of Nursing, East Carolina University

Submitted in partial fulfillment of the requirements for the degree of

Doctor of Nursing Practice

Finalized December 7, 2021

Notes from the Author

I would like to express my most sincere gratitude to the faculty and staff of my program, as well as the facility that welcomed the implementation of this DNP project. This DNP project has served as an excellent learning opportunity to train the next generation of CRNAs in the ways of quality improvement to further invest in our profession. I greatly appreciate my program director for this opportunity, our site coordinator for connecting us to the willing participants, and our editor for her countless hours training us in the ways of scholarly writing. With many thanks I also wish to acknowledge the staff at this facility who took their time to participate into this project.

This paper is dedicated to the many classes of doctorally prepared CRNAs to come. As we learn and grow in our profession it is my hope we never stay stagnant. With an open mind and dedicated spirit, we can continue to better ourselves for our patients throughout our careers.

Abstract

This DNP Project aimed to assess the perceptions of CRNAs and PACU RNs regarding a standardized handoff checklist utilized during transfer of care from the operating room to the PACU in a level one trauma center in the southeastern United States. While CRNAs use a systematic approach to giving handoff, there is currently no required standardized method for all CRNAs to use when at this institution. CRNAs were provided instruction on use of the American Patient Safety Foundation PACU Handoff Checklist and utilized the checklist for a two-week period. Qualtrics surveys were distributed to the five participating CRNAs before and after the pilot project to assess their opinions on their current handoff method compared to handoff using the checklist. PACU RNs were given a survey upon transfer of care to assess their perceptions completeness and efficiency of handoff when the checklist was used. All CRNAs agreed the checklist was a comprehensive and efficient way to organize information. The majority of PACU RNs (n=28) believed the checklist contributed to an efficient and comprehensive handoff report. This pilot project could be utilized by the facility for future quality improvement projects.

Keywords: handoff, checklist, report, PACU, anesthesia

Table of Contents

Section I. Introduction

Background

The Joint Commission reported 1,744 deaths and $1.7 billion in hospital malpractice costs were generated in the United States between 2010 and 2015 associated in some way with inadequate communication (2017). Upon surgical patient transfer of care from the operating room (OR) to the post anesthesia care unit (PACU) the Certified Registered Nurse Anesthetists (CRNAs) relay pertinent information, in a handoff report. When this process is performed consistently, it allows the PACU registered nurses (RNs) to deliver appropriate care promptly and can decrease PACU stay times and associated costs. Alternatively, delivering partial or inaccurate handoff reports and omitting key details when transferring patients can lead to poor patient outcomes as well as increased costs for the organization. The Joint Commission (2017) defines a handoff process as:

> 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. (p.1)

There are no specific local, state, or national standards regarding post-operative handoff, but The Joint Commission (2017) recommends that hospitals standardize the method with which healthcare professionals relay pertinent information both verbally and in written form, with safety and efficiency at the forefront. They suggest the use of a standardized tool to accomplish this mission. The American Association of Nurse Anesthetists (AANA) standards also address the handoff process in standards 11, 12, and 14.

There are many handoff tools available both electronically and in print. The Situation, Background, Assessment, Recommendation (SBAR) method has long been taught in nursing curriculum and is available within many electronic medical record systems (AANA, 2014). Several checklists have also been created specifically for the post-anesthesia handoff period (Agarwala, et al., 2015; Halladay, Thompson, & Vacchiano, 2018; Halterman et al., 2019; Jullia et al., 2017; Krombach et al., 2015; Lopez-Parra et al., 2020; Potestio et al., 2015, Pucher et al., 2015).

Organizational Needs Statement

The partnering organization for this Doctor of Nursing Practice (DNP) quality improvement project was a level one trauma hospital in the southeastern United States. This 1,000-bed facility performs approximately 32,000 procedures requiring anesthesia per year, most of which require subsequent handoff reports from the CRNA managing the case to a PACU RN who provides care during the recovery period.

This facility does not currently use a standardized tool for delivering handoff from the OR to the PACU. There is, however, a policy in the hospital system regarding handoff reports that details the utilization of the SBAR method of communication. While many of the CRNAs at this institution use a systematic method of providing PACU handoff reports, the department does not utilize a standardized tool.

Healthy People 2030

One tenet of Healthy People 2030 is that "helping health care providers communicate more effectively can help improve health and well-being" (Office of Disease Prevention and Health Promotion [ODPHP], 2020a, para. 2). This DNP project focused on this goal during the exchange of patient information from one healthcare professional to another. According to

Healthy People 2020, effective communication used by healthcare professionals can "improve health care quality and safety" as well as "increase efficiency of health care service delivery" (ODPHP, 2020b, para.6). Handoff processes are crucial communication events in healthcare, and using standardized tools could assist in providing safe, high-quality, and efficient care.

HI Triple Aim

This project also addressed elements of the Institute for Healthcare Improvement (IHI) Triple Aim. The three parts to the Triple Aim are "improving the patient experience of care, improving the health of the populations, and reducing the per capita cost of health care" to address the social needs of healthcare (Triple Aim, 2020, p.1). Using complete and accurate handoff process from the CRNA could allow the PACU RN to deliver timely, efficient, and patient-centered care (The Joint Commission, 2017). This improves the patient experience of care, as evidenced by increased patient satisfaction scores (Trinh et al., 2019). Higher patient satisfaction scores in turn increase federal funding to the hospital through Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) scores. Lastly, improving the handoff process may reduce per capita cost of health care by decreasing PACU stay times and decreasing frequency of medical errors.

AANA Standards

The AANA developed the Standards for Nurse Anesthesia Practice to "support the delivery of patient-centered, consistent, high-quality, and safe anesthesia care" (2019, p. 1). There are three standards that apply to this quality improvement project. Primarily, standard 11, which addresses transfer of care and the need to communicate essential information regarding the patient's condition when transferring the patient to another qualified healthcare provider. Next standard 12, which discusses quality improvement processes and how anesthetists should

participate in perpetual analysis of care and attempt to improve outcomes. And lastly, standard 14, which identifies the culture of safety and the need to engage among interdisciplinary team members with open communication to provide cooperative patient-centered care (AANA, 2019).

Anesthesia Patient Safety Foundation Perioperative Patient Safety Priorities

The Anesthesia Patient Safety Foundation (APSF) perioperative safety priorities addressed in this project include patient-related communication issues, handoff, transitions of care, and cost-effectiveness (2020). During handoff of patients from CRNAs to PACU RNs these issues may be addressed through eye contact, open communication, and standardization of delivery method. One standardized method is the APSF Handoff Checklist.

Problem Statement

While anesthesia providers have a systematic method for giving report, they do not use a common reporting tool. Since inadequacies and inconsistencies have been identified during handoffs between anesthesia providers and PACU RNs (Lambert & Adams, 2018) there is a potential for incomplete or inefficient handoff reports.

Purpose Statement

The purpose of this quality improvement project was to assess anesthesia providers' and PACU nurses' perceptions of adequacy of a standardized tool: the APSF PACU Handoff Checklist.

Section II. Evidence

Literature Review

There is an abundance of literature on the topic of patient handoff procedure in hospitals. To identify literature addressing solutions for inadequate and untimely handoff reports in the post-operative period, structured searches of two databases and one search engine were performed. Cumulative Index to Nursing and Allied Health Literature (CINAHL) was searched using the subject headings “hand off (patient safety)” and “post anesthesia care units.” PubMed was searched using the MeSH terms “patient handoff” and “anesthesia” as well as keywords identified through the automatic mapping feature of new PubMed. This search strategy yielded 67 results in CINAHL and 144 results in PubMed. Limiting to 5 years (2015 to 2020) then resulted in 39 and 83 results respectively. Items were also identified through Google Scholar, professional organizations, article linking functions of the databases, and reference searching.

Results were screened by first reading titles, keywords, and abstracts, followed by the full-text level. Fifteen pertinent articles were identified. These ranged from quality improvement to cohort studies to single descriptive qualitative studies. Through Google, pertinent papers regarding guidelines from reputable sources like The Joint Commission and the APSF were also identified and reviewed in their entirety. See Appendix A for database search terms, Appendix B for search results, and Appendix C for a matrix of relevant literature.

Current State of Knowledge

Current literature addressing patient handoff reports supports standardization of handoff delivery as an effective method for increasing consistency and accuracy which ultimately supports the safety of patients. Most evidence supporting this practice is within levels five and six according to Melnyk and Overholt’s level of evidence classification system, which includes

evidence from systemic reviews of descriptive and qualitative studies, and evidence from single descriptive or qualitative studies, respectively (2011). Multiple quality improvement initiatives performed in hospitals provide added support for the use of a standardized checklist, as do several randomized controlled trials and systematic reviews. Identified evidence supports use of a standardized method for delivering handoff report to improve the quality of handoffs. This evidence has been used to guide development of existing guidelines and recommendations.

APSF formed a perioperative multi-center handoff collaborative to address the patient safety priority "patient-related communication issues, handoffs and transitions to care" (2020, p.1). The collaborative has a handoff education database about handoff process which recommends education and training, inclusion of all members of a team, and use of a standardized method. The APSF has even developed their own tool, the APSF PACU Handoff Checklist.

The Joint Commission's *2020 National Patient Safety Goals* address handoff in Goal 1, "improve accuracy of patient identification" by using at least two patient identifiers (p.1), and Goal 2, "improve communication" among healthcare providers by implementing procedures for managing critical information (p. 2). These goals are also addressed through a sentinel event alert which includes "critical content to communicate to the receiver during handoff such as illness assessment, patient summary, to-do action list, contingency plans, allergy list, code status, medication list, laboratory tests, and vital signs" (The Joint Commission, 2017, p. 4). Additionally, The Joint Commission calls for standardization of critical content verbally and in written form, by utilizing standardized tools and methods such as forms, templates, checklists, protocols, and mnemonics. Though The Joint Commission created the Targeted Solutions Tool for Handoff Communications, they do not enforce its' use in every setting (2017).

In 2014 the AANA published *Patient-Centered Peri-Anesthesia Communication Practice Considerations* which addresses transfer of care. They suggest two-way verbal exchange face-to-face, open communication, limited distractions, adherence to policy, and use of checklists and mnemonics such as SBAR (situation, background, assessment, recommendation) and PATIENT (patient, airway, anesthetic, temperature, intravenous, end-tidal, narcotics, twitches). Again, the AANA suggests a model for standardization to decrease communication errors but does not specify which tool is best for use (2014).

Current Approaches to Solving Population Problem

Current literature describes the need for support from key stakeholders, implementation of a standardized delivery method, and education on the chosen method. Key stakeholders are aware of what they need in a tool and they will be more likely to support the use of a tool they have chosen or created. Staff members have invaluable experience and can increase the quality of a chosen tool (Rose et al., 2019). Additionally, when they agree to the process of development, staff members are more willing to use the new tool. Getting support from staff when developing or deciding on a standardized tool can be an effective method to increase compliance (Scott et al., 2017).

Implementation of a standardized delivery method has been investigated with various tools in the literature. Multiple studies have shown electronic handoff tools to be beneficial as they took advantage of the electronic medical record by letting it populate the information needed for handoff (Halladay et al., 2019; Shah et al., 2018; Weinger et al., 2015). Electronic checklists also prevent the omission of important data through structured verification (Agarwala et al., 2015; Pucher et al., 2015). Written handoff tools require transcription of patient information with prompts, like allergies and case type, to communicate important information to

the next healthcare professional (Lambert & Adams, 2018). Several studies investigating paper checklists have shown they allowed pertinent information to be checked off as it was relayed, with no patient information transcribed on the tool (Halterman et al., 2019; Jullia et al., 2017; Krombach et al.,2015; Lopez-Parra et al., 2020; Pucher et al., 2015) The Introduction, Situation, Background, Assessment Recommendation (ISBAR) checklist and Targeted Solutions Tool (TST) have been described and advocated for as preferred standardized tools (Benjamin et al., 2016; Pakcheshm et al., 2020). Identified studies demonstrated tools and checklists, either written or electronic, were beneficial in the standardized delivery of information at handoff.

In addition to obtaining buy-in from key stakeholders and identifying an appropriate tool for the specific setting, educating users on use of a tool has been demonstrated to increase efficacy of use. The implementation of a tool has been shown to have no improvement in handoff communication if not accompanied with training on that tool (Jullia et al., 2017). One study showed that an introduction of the literature supporting the tool accompanied by a review of the tool and practicing mock handovers increased handoff completeness (Jullia et al., 2017). Team training can also address attitudes and behaviors of key stakeholders to develop an approach to implementations (Agarwala et al., 2019). Simulation can be utilized to increase compliance with handoff tools as well (Weinger et al., 2015).

The literature addressing education also addresses how to manage extraneous factors that commonly interfere with organized handoff. Completing urgent tasks such as applying monitoring equipment and insuring adequate vital signs should be performed before handoff is attempted (Barbeito et al., 2018). Superfluous noise should be eliminated by providing a quiet location for handoff; and turn-taking should be kept to a minimum (Webster et al., 2020). These

barriers to complete and efficient handoff can be addressed through education prior to implementation.

After reviewing this evidence supporting various interventions, as well as the AANA Standards for Nurse Anesthesia Practice (2019), The Joint Commission National Patient Safety Goals (2020), and the APSF Patient Safety Initiatives (2020), implementation of a standardized checklist was selected as the intervention to be utilized in this quality improvement project. This evidence indicates that a use of a checklist for patient handoff can improve patient outcomes, efficiency, and safety by standardizing information delivery.

Evidence to Support the Intervention

The APSF is a respected organization, and the hospital was willing to utilize this tool as they have implemented APSF recommendations in the past. The APSF advocates for a succinct checklist that decreases the burden of standardization and increases compliance while addressing The Joint Commissions goals for standardization of handoff to increase patient safety. This concise checklist has demonstrated higher frequency of key information handoff, with an average of only 26 seconds added to the handoff time (Potestio et al., 2015). Additionally, by adding only 26 seconds to include pertinent information, the PACU RN can decrease time wasted searching through the patient's chart.

Providing education on handoff tools has been shown to increase efficacy of tool implementation (Agarwala et al., 2019; Jullia et al., 2017; Weinger et al., 2015). Using technology to educate participants addresses Healthy People 2020 goals of using technology to enable quick access to information and to design programs that result in improved health care quality. Key stakeholders also recommended the use of easily accessible technology for education to increase compliance.

Evidence-Based Practice Framework

This project was informed by the Shannon-Weaver Linear Communication Model which describes a method of communication that can be applied to anesthesia handoff where a message travels from a sender to a receiver (Shannon, 1948). When applying this framework to anesthesia handoff process, the sender is the anesthesia provider, the message is handoff report, and the receiver is the PACU RN. The handoff message has to travel through the channel, the busy post-anesthesia care unit, often complicated by many environmental factors including time pressure, noise pollution, and competing priorities. At the time of patient transfer to PACU, the nursing staff member is absorbing pertinent information while also attaching the patient to monitors, maintaining the safety of other patients, and remaining aware of other unit happenings that might require their attention. Applying the Shannon-Weaver Linear Communication Model to the handoff process allows healthcare professionals to identify where errors may occur. The implementation of a standardized handoff tool can assist with every step of this communication model as seen in Appendix D.

Ethical Consideration & Protection of Human subjects

This project was deemed quality improvement and met criteria for exempt status per a screening review process approved by the University and Medical Center Institution Review Board (UMCIRB) as well as an approval process through the participating organization's department of research in conjunction with the UMCIRB. See Appendix E. Before creation and implementation of this project, Collaborative Institutional Training Initiative (CITI) modules were completed by the primary researcher. There were no patients involved in, or patient information collected in, this project. All participants were employees working within the facility

who volunteered to participate, the intervention fell within normal practice parameters of the organization, and all responses were collected electronically through a confidential survey link.

An ethical consideration for this project was adding a new tool into a critical time for patient care. PACU RNs and CRNAs could experience some level of added distraction in the immediate post-operative period when a new tool is introduced. Alternatively, the intervention could improve the completeness of handoff reports for patients. There was no specific exclusion of any providers in our target population based on the intervention as it was deemed equally useful to all practicing in this role and setting. There was no more than minimal risk of harm associated with this project as the intervention fit within currently accepted standards of care.

Section III. Project Design

Project Site and Population

Description of the Setting

The setting for the quality improvement project was a level one trauma center in the southeastern United States which has 1,000 beds and serves critically ill patients in a rural area. Approximately 32,000 procedures requiring anesthesia are performed at this facility per year. This project took place during the transfer of postoperative patients from the care of the CRNA performing anesthesia during the procedure to the PACU RN receiving the patient for recovery. Handoff reports are generally completed in the PACU which can be a busy and distracting environment in which to communicate critical information.

Description of the Population

The population of interest in this study included CRNAs and PACU RNs. The participating CRNAs volunteered after being recruited by a CRNA faculty member familiar with the clinical setting. Participation was open to all CRNAs employed in the designated setting. All PACU RNs were asked to participate if they received report from participating CRNAs. Their consent was obtained through the completion of the confidential surveys. Specific demographic information was not obtained to maintain confidentiality with the small sample size.

Project Team

The team implementing this quality improvement project was comprised of a student registered nurse anesthetist (SRNA) a CRNA faculty member who served as the project chair and program director, and a clinical CRNA faculty member who acted as liaison with the study setting and recruited participants. The clinical manager also assisted with this project. An additional faculty member coordinated project development and implementation. Initial

development of the project was accomplished in cooperation with three additional students who were addressing the same clinical issue in other settings. The primary SRNA took the lead in regard to implementing the educational tool, administering surveys assessing participant perceptions, and analyzing the survey data.

Project Goals and Outcome Measures

Description of the Methods and Measurement

This quality improvement project used a pre-and post-survey design and consisted of a single Plan, Do, Study, Act (PDSA) cycle of quality improvement efforts addressing patient handoff from the OR to the PACU (IHI, 2020). CRNAs were recruited by a clinical CRNA faculty mentor. An email including the APSF PACU Handoff Checklist, a video with instructions for use, and pre- and post-surveys were sent to the CRNAs who volunteered to participate. The PACU RNs also received an email with instructions about participating in the project. Before using the tool, the CRNAs answered a Qualtrics survey assessing their current handoff practice. Following completion of the pre-survey, the two-week implementation period began. The CRNAs gave report to PACU RNs after anesthesia encounters using the APSF PACU Handoff checklist. The PACU RN was then given an assessment tool during handoff report from the CRNA which asked about their perceptions of completeness and efficiency of the handoff tool. After two weeks of using the tool, the CRNAs completed a post-intervention survey addressing their perceptions as well.

Discussion of the Data Collection Process

Data was collected using Qualtrics survey links sent electronically to the professional email addresses provided by participating CRNAs. Responses were collected confidentially through the survey software. The CRNA participants completed two surveys each: one before the

implementation and one after. The survey used binary, Likert type, and open-ended questions. Participating PACU RNs completed printed post-intervention assessment cards provided to them during report by the CRNA. They then placed their anonymous completed cards in the locked drop-box after each handoff encounter. The confidential responses of the PACU RNs were retrieved from the locked box at the completion of the two-week study period. The pre- and post-surveys can be found in Appendix F and the APSF PACU Handoff Checklist can be found in Appendix G. Participation by both CRNAs and PACU RNs was completely voluntary with no individual benefits or negative consequences associated with participation or non-participation.

Implementation Plan

First, CRNAs were recruited with equal opportunity to participate in the project by the clinical faculty CRNA. Next, all CRNAs who volunteered to participate in the project received an email with an educational video, a pre-survey, and the APSF PACU Handoff Checklist. The video educated them on the evidence to support standardized handoff as well as how to implement the APSF PACU Handoff Checklist. After they watched the educational video and were introduced to the project, they took a pre-intervention survey via Qualtrics and saved the APSF PACU Handoff Checklist to their handheld device. Any questions regarding implementation were answered by the project team at that time. After providing anesthesia for a procedure, the CRNAs delivered patient handoff report to the PACU RN utilizing the APSF PACU Handoff Checklist for a period of two weeks. The CRNA gave a numbered survey to the PACU RN when giving patient handoff. If willing to participate in the project, the PACU RN then filled out the survey assessing the completeness and efficiency of the handoff and placed it in the conveniently located locked box in the PACU. At the completion of the two-week implementation period the CRNAs completed a Qualtrics survey assessing their perception of the

completeness and efficiency of handoff when utilizing the APSF Handoff Checklist and the responses of the PACU RNs participants were collected. All Qualtrics survey responses and PACU RN surveys remained confidential.

Timeline

Literature review for this quality improvement project was completed in the fall of 2020. The Qualtrics survey, PACU RN survey, educational video, and handoff tool were finalized in March of 2021. Organizational approval was obtained in the month of March 2021. During the month of May 2021, surveys were sent out via email, pre-intervention surveys were completed, the project was implemented, post-intervention surveys were completed, and data was gathered. Analysis was performed during the summer of 2021. The results were presented via poster in November of 2021. A visual representation of this timeline can be found in Appendix H. The ongoing COVID 19 pandemic limited opportunities for social interaction and education options.

Section IV. Results and Findings

Results

CRNAs received an email with instructions, a video with information on the project, and a pre-intervention survey the Friday before data collection started. Data collection then began on a Monday in May 2021 and continued for a two-week period. The CRNAs had the weekend before data collection to review the instructions for using the handoff tool and ask any questions. The primary investigator met with each CRNA participant face-to-face on their first day of data collection to discuss the process and to deliver the handoff tool and PACU surveys. The CRNAs were followed up with face-to-face throughout the two-week period to ensure they had an adequate supply of tools and a good understanding of the process. The primary investigator followed each anesthetic case from the operating room to the PACU in the first week of implementation of the project to educate the PACU nurse on how to complete and submit the PACU RN survey of their perception of the handoff tool. Any questions about the tool were then addressed face-to-face with the PACU RN by the primary investigator. At the end of the two-week period the five CRNAs participants received an email to complete the post-intervention survey and a follow-up email was sent one week later to all CRNAs reminding them to complete the survey.

All five CRNAs who participated in the project completed the pre- and post-surveys assessing their perception of the APSF PACU Handoff Checklist. All CRNAs “agreed” or “strongly agreed” the APSF PACU Handoff Checklist was an efficient and comprehensive way to organize the material communicated and that the tool did not lend itself to communication errors. In total, 31 PACU RN surveys were submitted to a locked box specifically placed in the

unit for survey collection. All CRNAs and approximately 70% of PACU RNs "agreed" or "strongly agreed" the tool contributed to both efficiency and comprehensiveness of OR handoff.

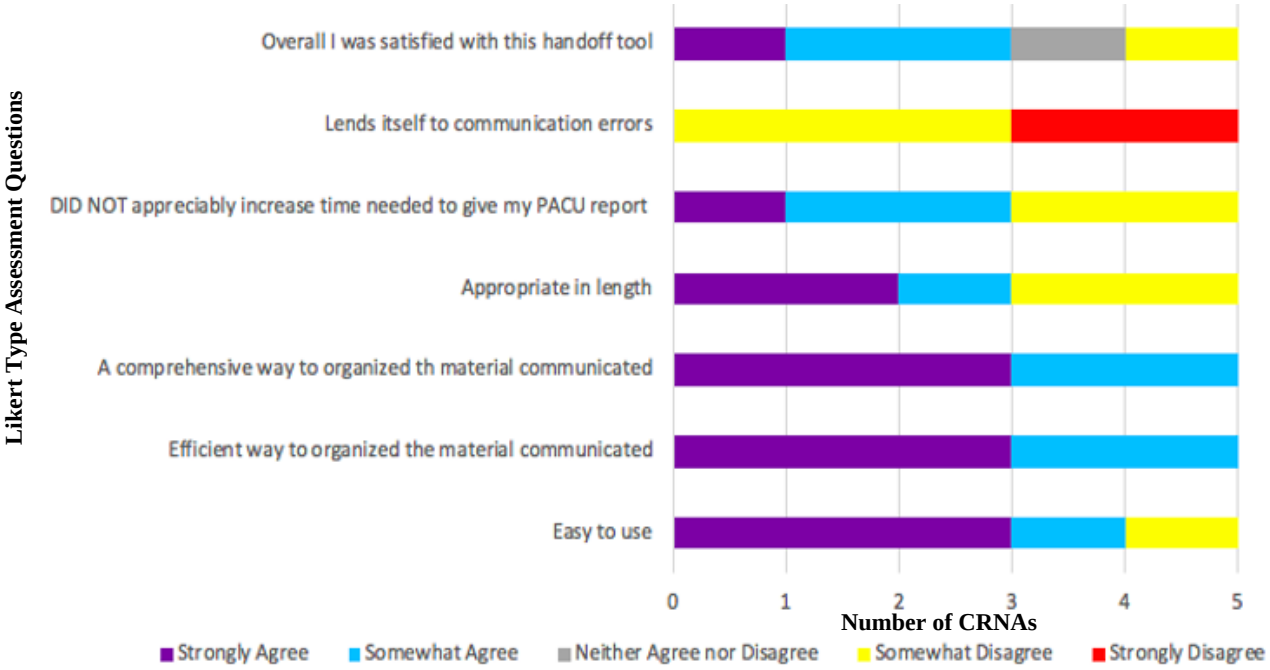
Analysis

The pre-intervention survey was only distributed to CRNAs. All five CRNAs reported having a consistent method of delivering report to PACU RNs for all anesthetic cases, but said there is no standardized tool, checklist, or mnemonic currently used by all anesthesia providers in the department. All of the CRNAs who took the pre-intervention survey agreed (either strongly or somewhat) to the following statements using a Likert-type scale: their current handoff process provides an efficient way to transfer information, their current process provides a comprehensive way to transfer information, and they are satisfied with the transfer of care process they currently use. When asked if the handoff process they currently use lends itself to communication errors, two CRNAs somewhat disagreed, two were neutral, and one somewhat agreed.

The post-survey was also only distributed to CRNAs. All five CRNAs who completed the pre-survey also completed the post-intervention survey. Across the two-week implementation period the CRNAs reportedly used the tool anywhere from 4-15 times each. After using the tool for two-weeks, three of the five CRNAs were enthused about future use of the APSF PACU Handoff Checklist, one was neutral, and one was not enthused. The CRNAs assessed the APSF PACU Handoff checklist with a Likert-type scale; these results are displayed in Figure 1.

Figure 1

Post-Intervention CRNA Perception of the APSF PACU Handoff Checklist (n=5)



In addition to questions using the Likert-type scale, open-ended questions were also utilized. One person commented that the APSF PACU Handoff Checklist was difficult to use due to the length of time needed and excessive material included in the tool. One CRNA planned to continue to utilize the tool after the completion of this quality improvement project commenting, "it is a great tool. I am planning on carrying it for a while longer to improve my handoff technique. It is comprehensive." One of the CRNAs found a benefit of using the tool was to "standardize handoff and the person receiving report would know the order of report and what to expect."

PACU RNs also submitted surveys in which they assessed the efficiency and comprehensiveness of the tool. As previously stated, though 31 surveys were submitted only 24 of those were complete. Table 1 displays the comprehensive nature of the tool in assessing

various components included during handoff report. Of all of the APSF PACU Handoff Checklist's categories, antibiotics had the highest rate of omission, while intake, output, pain, and nausea management had the highest inclusion rates.

Table 1

Post-Intervention PACU RN Survey Results Assessing Completeness of APSF PACU Handoff Checklist

Were the following areas addressed in handoff?	n	Yes	No	N/A
Was the patient identified	31	97%	3%	
Allergies	31	94%	6%	
Antibiotics	30	80%	13%	7%
Intake/ Output	30	100%		
EBL	30	97%	3%	
Pain management	30	100%		
Nausea management	28	100%		
Any major concerns that might affect PACU care addressed	24	67%	3%	30%

In addition to the results included in Table 1, 66% of the PACU RNs surveyed (n=28) "agreed "or "strongly agreed" the checklist contributed to an efficient handoff report and 71% of the PACU RNs surveyed (n=28) "agreed" or "strongly agreed" the checklist contributed to comprehensive handoff report. None (n=29) reported needing to clarify information after transfer by calling back the provider, and 62% (n=29) would like to see this handoff checklist used in the future. In conclusion, the majority of CRNAs and PACU RNs found the tool efficient and complete.

Section V. Interpretation and Implications

Cost Benefit Analysis

This project cost $85 in materials (see Table 2) and took minimal time from CRNAs and PACU RNs to implement. Most of the time dedicated to the project from CRNAs was unpaid time at home to review directions and answer surveys. If this project was implemented in the hospital, the cost would include printing and laminating the tools if desired. Each CRNA could have their own copies of the checklist and nearly 100 checklists would need to be printed. Alternatively, the checklists could be printed, laminated, and placed in the PACU bay so only 20 would be needed. If the tool was displayed in the PACU bay, PACU RNs and CRNAs would have a standardized checklist they could both refer to during report. A no-cost option that would be to have the CRNA simply carry the tool as an image on their personal devices and refer to the checklist during report. If the hospital was implementing this project, the surveys and collection box would not need to be purchased, the only cost would be the checklist and the time it took to educate staff on it, which could be accomplished in regularly scheduled morning meetings.

Table 2

Project Budget

	Quantity	Cost per unit	Total Cost
Video production and development	1	1	0
Qualtrics Subscription	1	$10	$10
PACU RN Surveys	100	$0.40	$40
Laminated Handoff Tool	10	$1.50	$15
Survey Collection Box	1	$20	$20
Total Cost of the Project			**$85**

This is a low-cost intervention when considering the potential benefits of improved communication and patient safety. A standardized tool could assist in providing consistent and efficient quality care to patients in the peri-operative period. Improved communication between healthcare providers has been associated with improved work satisfaction, teamwork, and staff retention.

Though CRNAs believed the APSF PACU Handoff Checklist took longer to use than their current method, completeness of the tool may prevent the need for the PACU RN to search documentation or seek out the CRNA for additional clarification of patient information after the

handoff report occurs. Wasted PACU time costs $6-8 per minute (Pease, 2015), so any time saved by the PACU RN having a complete understanding from handoff reports will save the hospital money.

Additionally, the opportunity for improved patient outcomes can save money as well. Improved patient outcomes include decreased postoperative nausea and vomiting, decreased pain, decreased adverse events and identity errors (Pease, 2015). When PACU RNs have a complete understanding of the intra-operative course of events it is easier for them to treat pain and nausea appropriately. The checklist encourages use of two patient identifiers to ensure the correct patient is receiving care and review of allergies to assure the providers are aware of past issues and prevent accidental exposures to treatments or procedures that have caused adverse allergic reactions in the past.

An increase in workplace satisfaction from streamlining this process could save in re-hiring costs from RN and CRNA turnover. It costs $50,000 to train one PACU nurse (NSI Nursing Solutions Inc, 2019). Though the handoff process is unlikely to be the primary reason staff members resign, building a positive work environment in the transition of care can assist in fostering teamwork and improving workplace satisfaction.

In all three areas including PACU stay time, improved patient outcomes, and workplace satisfaction, this project poses great opportunities for cost savings. Additionally, The Joint Commission stated communication failures in U.S. hospitals and medical practices contributed to 1,744 deaths and $1.7 billion in malpractice over five years (2017). Although this does not directly reflect the cost of poor handoff process during the peri-operative period, it is clear poor communication can lead to increased expense, and even loss of human life. Undoubtedly, this

inexpensive project could have a positive effect on the organization. The department may consider implementing a more formal department wide or system wide QI project in this area.

Resource Management

Should the organization adopt a similar intervention there are resources currently available to support it. The best resource already in the facility is staff willing to consider change and adapt for the betterment of patient care. The hospital does already have printers, papers, and laminators should they choose to supply the handoff checklist via hardcopy. Each of the staff members has a compatible phone if they would prefer to have the checklist electronically available to them for free. Lastly, the hospital uses an electronic medical record which could potentially have a new tab created with the standardized handoff checklist if the facility desired development in that area. Though programming the tool into the electronic medical record could take time and funds, the hardcopy method could easily be feasible to the institution until an electronic version is available.

Implications of Findings

The use of a standardized checklist supports the Triple Aim goal of improving patient experience of care, improving health of populations, and reducing the per capita cost of health care (2020). When the PACU RNs have a complete understanding of intra-operative care they are better able to provide continuity of care and improve the patient experience in the peri-operative period. Per capita cost of healthcare is decreased if redundant treatments or medical errors are avoided through improved communication. On a grander scale, the health of populations is also improved by decreasing adverse events from improved communication.

As addressed in Standard 11, the implementation of the APSF PACU Handoff Checklist supported the delivery of patient-centered, consistent, high quality care during transfer of care

between the OR and PACU (AANA, 2019). Additionally, the checklist assisted in the delivery of essential information as Standard 11 supports. Asking CRNAs to perform the post-intervention survey also showed the importance of anesthetists participating in ongoing analysis of care to attempt to improve outcomes as per Standard 12.

The APSF PACU Handoff Checklist was used in this quality improvement project and serves to make safety a priority. APSF prioritizes handoff process and transition of care which were the focus and setting of this project. Cost-effectiveness, another APSF priority, was achieved through this inexpensive intervention as well by utilizing previously established resources (APSF, 2020).

Implications for Patients

Although the purpose of this project was to assess CRNA and PACU RN perceptions of the completeness and efficiency of the APSF PACU Handoff Checklist, the broader implications include increasing patient safety in the peri-operative period with improved, standardized communication. Patient care improves with seamless continuity of care where key information is relayed accurately. Indirectly, improved communication of previous anesthetic treatments can lead to improved pain and nausea control in the peri-operative period as well as improved patient satisfaction. On a larger scale, improved patient satisfaction has the ability effect the population by increasing trust in healthcare and willingness to seek care.

Implications for Nursing Practice

The concept of standardized handoff process is not new to nursing, or to the peri-operative period. Even with vast evidence supporting the concept, nursing has yet to implement it across the board. With an open mind to this new process, nurses and nurse anesthetists have an opportunity to change current practice if they so desire.

Impact for Healthcare System

For the healthcare system, this initiative could assist in highlighting the importance of a standardized handoff process. Like a pre-flight checklist, this is one of the many safety measures that could improve patient care in all areas of the health system. This initiative may spark other conversations regarding quality improvement and safety that could continue to foster an evidence-based environment and decrease costs related to adverse events.

Sustainability

There are many ways to increase the sustainability of this project. Giving each CRNA laminated copies of the checklist would likely be the least sustainable method as there is turnover and the checklist is easy to lose. A more sustainable option would be to place the checklist on the wall in the PACU bedspace. Another sustainable option would be to embed the checklist into the electronic medical record. Both of these methods would have costs up front, but very little upkeep.

Dissemination Plan

The results from this quality improvement project will be presented in person and via Zoom to faculty and students in the CRNA program, with participants of the project invited to attend remotely via Zoom. The poster presentation will include the purpose, methods, key findings, and a summary of the project. This paper will also be submitted to The Scholarship, East Carolina University’s digital repository for scholarly works.

Section VI. Conclusion

Limitations

Although five CRNAs graciously completed both pre- and post-intervention surveys for this quality improvement project, the small number of participants limited statistical analysis of finding. As such, this should be considered a pilot project. Of the surveys kindly submitted by the PACU nurses, several were incomplete, which also limited data analysis. Additionally, along with responses being subjective, the implementation of the checklist by CRNAs was not monitored. Therefore, PACU RN surveys may assess CRNA reports that did not actually align completely with the checklist.

Recommendations for Others

One recommendation for others performing follow-up projects is to start the process by getting CRNAs and RNs invested in the outcome by having them choose handoff tools they believe are high quality. Alternatively, challenge the staff to create their own handoff tool that incorporates important information within their setting. Many CRNAs shared checklist improvement ideas when completing the free response box on the post-intervention survey. Staff may be willing to share their ideas and even create their own tool. When staff is invested from the beginning they are more likely to give more effort, see the project through, and be proud of the outcome.

Those performing follow-up projects might also consider laminating the chosen or developed handoff tool and placing it above the head of the bed in the PACU where the sender and receiver can both see it. A write-on-wipe-off marker could even be used to check off the items or fill in the information on the laminated sheet. Other issues to consider include ensuring proper education on the tool, promote open communication, foster an environment of evidence-

based practice and teamwork. Frequent requests for feedback on the tool and ongoing reevaluate the process are also suggested.

Recommendations for Further Study

There is abundant research supporting the use of a standardized handoff delivery method, but there are many opportunities for further study in this area. An interesting study could compare the patient outcomes and PACU times of two separate groups, one with a standardized handoff tool the facility develops, and one with the CRNAs continuing current practice. Other recommendations include assessing patient satisfaction in the peri-operative period, measuring adverse outcomes or improved speed of helpful treatments, and assessing cost-savings associated with any differences in PACU stay times with and without the tool. One could also assess staff satisfaction after one year of implementing the tool they had created to see if using their own tool had increased workplace satisfaction.

References

Agarwala, A. V., Firth, P. G., Albrecht, M. A., Warren, L., & Musche, G. (2015). An electronic checklist improves transfer and retention of critical information at intraoperative handoff of care. *Anesthesia and Analgesia, 121*(1), 96-104. http://doi.org/10.1213/ANE.0000000000000506.

Agarwala, A. V., Lane-Fall, M. B., Greilich, P. E., Burden, A. R., Ambardekar, A. P., Banerjee, A., Barbeito, A., Bryson, T. D., Greenberg, S., Lorinc, A. N., Lynch, I. P., Pukenas, E., & Cooper, J. B. (2019). Consensus recommendations for the conduct, training, implementation, and research of perioperative handoffs. *Anesthesia Analgesia, 129*(5), e71-e78. http://doi.org/10.1213/ANE.0000000000004118.

American Association of Colleges of Nursing. (2006). *The essentials of doctoral education for advanced nursing practice.* https://www.aacnnursing.org/Portals/42/Publications/DNPEssentials.pdf

American Association of Nurse Anesthetists. (2019). *Standards for nurse anesthesia practice.* https://www.aana.com/docs/default-source/practice-aana-com-web-documents-(all)/professional-practice-manual/standards-for-nurse-anesthesia-practice.pdf?sfvrsn=e00049b1_18

American Association of Nurse Anesthetists. (2014). *Patient-centered perianesthesia communication practice considerations.* https://www.aana.com/docs/default-source/practice-aana-com-web-documents-(all)/patient-centered-perianesthesia-communication.pdf?sfvrsn=7a0049b1_4

Anesthesia Patient Safety Foundation. (2020). *Patient safety initiatives.* https://www.apsf.org/patient-safety-priorities/

Barbeito, A., Agarwala, A., & Lorinc, A. (2018). Handovers in perioperative care.

Anesthesiology Clinics, 35(1), 87-98. http://doi.org/10.1016/j.anclin.2017.10.1007

Benjamin, M. F., Hargrave, S., & Nether, K. (2016). Using the Targeted Solutions Tool® to improve emergency department handoffs in a community hospital. *Joint Commission Journal on Quality and Patient Safety, 43*(3), 107-114. http://doi.org/10.1016/S1553-7250(16)42013-1

Institute for Healthcare Improvement. (2020). *Initiatives: The IHI triple aim.* http://www.ihi.org/Engage/Initiatives/TripleAim/Pages/default.aspx

Halladay, M., Thompson, J., & Vacchiano, C. (2019). Enhancing the quality of the anesthesia to postanesthesia care unit patient transfer through use of an electronic medical record-based handoff tool. *Journal of PeriAnesthesia Nursing, 34*(3). 622-632. http://doi.org/10.1016/j.jopan.2018.09.002

Halterman, R., Gaber, M., Janjua, M. S., Hogan, G. T., & Cartwright, S. M. (2019). Use of a checklist for the postanesthesia care unit patient handoff. *Journal of Perianesthesia Nursing, 34*(4), 834-841. http://doi.org/10.1016/j.jopan.2018.10.007

The Joint Commission. (2017, September 12). Inadequate hand-off communication. *Sentinel Event Alert*, (58), 1-6. https://www.jointcommission.org/-/media/tjc/documents/resources/patient-safety-topics/sentinel-event/sea_58_hand_off_comms_9_6_17_final_(1).pdf?db=web&hash=5642D63C1A5017BD214701514DA00139

The Joint Commission. (2020). *National patient safety goals effective July 2020 for the hospital program.* https://www.jointcommission.org/-/media/tjc/documents/standards/national-patient-safety-goals/2020/npsg_chapter_hap_jul2020.pdf

Jullia, M., Tronet, A., Fraumar, F., Minville, V., Fourcade, O., Alacoque, X., LeManach, Y., Kurrek, M.M. (2017). Training in intraoperative handover and display of a checklist improve communication during transfer of care. An interventional cohort study of anaesthesia residents and nurse anaesthetists. *European Journal of Anaesthesiology, 34*(7), 471-476. http://doi.org/10.1097/EJA.0000000000000636

Kromback, J.W., Marks, J.D., Dubowitz, G., & Radke, O. C. (2015). Development and implementation of checklists for routine anesthesia care: A proposal for improving patient safety. *Anesthesia & Analgesia, 121*(4), 1097-1103. http://doi.org/10.1213/ANE.0000000000000923

Lambert, L. H., & Adams, J. A. (2018). Improved anesthesia handoff after implementation of the written handoff anesthesia tool (WHAT). *AANA Journal, 86*(5), 361-370.

Lopez-Parra, M., Porcar-Andreu, L., Arizu-Puigvert, M., & Pujol-Caballe, G. (2020). Cohort study on the implementation of a surgical checklist from the operating room to the postanesthesia care unit. *Journal of Perianesthesia Nursing, 35*(2), 155-159. http://doi.org/10.1016/j.jopan.2019.08.015

Melnyk, B. & Overholt, E. (2011). *Evidence-based practice in nursing and healthcare: A guide to best practice* (4th ed.). Wolters Kluwer.

NSI Nursing Solutions Inc. (2019). *2019 health care retention and RN staffing report.* https://pdf4pro.com/amp/cdn/2019-national-health-care-retention-amp-rn-staffing-report-5bab3b.pdf

Office of Disease Prevention and Health Promotion. (2020a, October 28). *Goal: Improve Health Care.* Healthy People 2030. U.S. Department of Health and Human Services. https://health.gov/healthypeople/objectives-and-data/browse-objectives/health-care

Office of Disease Prevention and Health Promotion. (2020b). *Health communication and health information technology.* Healthy People 2020. U.S. Department of Health and Human Services. https://www.healthypeople.gov/2020/topics-objectives/topic/health-communication-and-health-information-technology

Pakcheshm, B., Bagheri, I., & Kalani, Z. (2020). The impact of using "ISBAR" standard checklist on nursing clinical handoff in coronary care units. *Nursing Practice Today, 7*(4), 266-274. http://doi.org/10.18502/npt.v7i4.4036

Pease, S. (2015). *How OR Efficiency Can Drive the Bottom Line*. TeamHealth Anesthesia https://www.beckershospitalreview.com/november-ceo-roundtable-conference/docs/Wednesday,%20November%2018/Track%20D/2_Wed_945am_OR_Efficiency_&_Cost_Effectiveness.pdf

Potestio, C., Mottla, J., Kelley, E., & DeGroot, K. (2015). Improving post anesthesia care unit (PACU) handoff by implementing a succinct checklist. *APSF Newsletter, 20*(1), 13-14. https://www.apsf.org/article/improving-post-anesthesia-care-unit-pacu-handoff-by-implementing-a-succinct-checklist/

Pucher, P., Johnston, M., Ashwaal, R., Arora, S., & Darzi, A. (2015). Effectiveness of interventions to improve patient handover in surgery: a systematic review. *Surgery, 158*(1), 85-95. http://doi.org/10.1016/j.surg.2015.02.017

Rose, M., Newman, S., &Brown, C. (2019). Postoperative information transfer: An integrative review. *Journal of PeriAnesthesia Nursing, 34*(2), 403-424. http://doi.org/10.1016/j.jopan.2018.06.096

Scott, A. M., Li, J., Oyewole-Eletu, S., Nguyen, H. Q., Gass, B., Hirschman, K. B., Mitchell, S., Hudson, S. M., & Williams, M. V. (2017). Understanding facilitators and barriers to care

transitions: Insights from project ACHIEVE site visits. *The Joint Commission Journal on Quality and Patient Safety, 43*(9), 433-447. http://doi.org/10.1016/j.jcjq.2017.02.012

Shah, A., Herstein, A., Flynn-O'Brien, K., Oh, D., Xue, A., & Flanagan, M. (2018). Six Sigma methodology and postoperative information reporting: a multidisciplinary quality improvement study with interrupted time-series regression. *Journal of Surgical Education, 76*(4), 1048-1067. http://doi.org/10.1016/j.jsurg.2018.12.101

Shannon, C. E. (1948). A mathematical theory of communication. *The Bell System Technical Journal, 27*(3), 379-423.

Trinh, L. N., Fortier, M. A., & Kain, Z. N. (2019). Primer on adult patient satisfaction in perioperative settings. *Perioperative Medicine, 8,* Article 11. http://doi.org/10.1186/s13741=019-0122-2

Webster, K. L., Lazzara, E. H., Keebler, J. R., Roberts, L. L., Abernathy, J. H. (2020). Noise and turn-taking impact postanesthesia care unit handoff efficiency. *Journal of Patient Safety and Risk Management, 25*(3), 99-105. http://doi.org/10.1177/2516043520925206

Weinger, M. B., Slagle, J. M., Kuntz, A. H., Schildcrout, J. S., Banerjee, A., Mercaldo, N. D., Bills, J. L., Wallston, K. A., Speroff, T., Patterson, E. S., & France, D. J. (2015). A multimodal intervention improves post anesthesia care unit handovers. *Anesthesia and Analgesia, 121*(4), 957-971. http://doi.org/10.1213/ANE.0000000000000670

Appendix A

Keywords, PubMed MeSH, and CINAHL Subject Headings Used for Literature Searches

	Concept	
	Handoff	PACU
Keywords	Handoff Sign-out Handover	PACU Post-Anesthesia Care Unit
PubMed MeSH	Patient Handoff	Anesthesia
CINAHL Subject Headings	Hand off (patient safety)	Post Anesthesia Care Units

Note. Keywords, PubMed MeSH terms, and CINAHL subject headings used to conduct literature searches in CINAHL, East Carolina University Libraries OneSearch, Google Scholar, and PubMed. Boolean operators were used in different combinations to yield search results.

Appendix B

Results of Searches

Search Strategy

Search date	Database or search engine	Search strategy	Limits applied	Number of results	Number kept
8/8/2020	PubMed	(patient handoff) AND (anesthesia)	In the last 5 years (2015-2020) Full text	83	5
8/14/2020	CINAHL	(handoff (patient safety) AND (post anesthesia care units)	In the last 5 years (2015-2020) Full text	39	6
8/20/2020	ECU Libraries OneSearch	(PACU) AND (handoff)	Last 5 years (2015-2020) Journal article Full text	105	5
9/11/2020	Google Scholar	(PACU) AND (handoff)	Last 5 years (2015-2020) Reviewed first 5 pages	779	2

Appendix C

Literature Matrix

Year	Author, Title, Journal	Design/Level of Evidence	Setting	Sample	Results
2015	Agarwala et al. An Electronic Checklist Improves Transfer and Retention of Critical Information at Intraoperative Handoff of Care Anesthesia & Analgesia	Interventional cohort study Level IV	OR	69 Handoffs	Electronic checklists improved retention of vital information from handoff
2015	Krombach et al. Development and Implementation of Checklists for Routine Anesthesia Care: A Proposal for Improving Patient Safety Anesthesia & Analgesia	Interventional cohort study Level IV	OR	Not reported	Checklists prevent errors
2015	Potestio et al. Improving Post Anesthesia Care Unit Handoff by Implementing a Succinct Checklist	Interventional cohort study Level IV	OR to PACU	50 Handoffs	Using the checklist increased the percentage of vital information

	The Official Journal of the Anesthesia Patient Safety Foundation				exchanged during handoff
2015	Weinger et al. A multimodal intervention improves post anesthesia care unit handovers Anesthesia & Analgesia	Cohort Level IV	OR to PACU	981 Handoffs	Acceptable handoffs increased with an electronic handover tool, educational webinar, and simulation training
2016	Benjamin et al. Using the Targeted Solutions Tool® to Improve Emergency Department Handoffs in a Community Hospital The Joint Commission Journal on Quality and Patient Safety	Cohort Level IV	Regional Hospital ED	221 Handoffs	Implementing the Targeted Solutions Tool® with training materials and handoff communication scenarios decreased defective handoff
2017	Jullia Training in intraoperative handover and display of a checklist improve communication during transfer of	Interventional cohort study Level IV	Two geographically different hospital sites	204 Handoffs	Checklist implementation did not improve handoff without education

	care. An interventional cohort study of anaesthesia residents and nurse anaesthetists. European Journal of Anaesthesiology				
2017	Scott et al. Understanding facilitators and barriers to care transitions: Insights from Project ACHIEVE site visits. The Joint Commission Journal on Quality and Patient Safety	Qualitative Level VI	22 health care organizations including community hospitals, academic medical centers, integrated health systems and community parternishps.	810 participants	Generating buy-in among staff is essential for effective care transitions
2018	Barbeito et al. Handovers in perioperative care. Anesthesiology Clinics	Quality Improvement			Education in team skills and communication

					improves efficiency and safety during handoff
2018	Lambert & Adams Improved anesthesia handoff after implementation of the written handoff anesthesia tool (WHAT) American Association of Nurse Anesthetists	Single Quantitative Quasi-experimental Level VI	New Bern, NC PACU	37 Handoffs	Written Handoff Anesthesia tool increased satisfaction with handoff and decreased defective handoff
2018	Shah et al. Six Sigma Methodology and Postoperative Information Reporting: A Multidisciplinary Quality Improvement Study With Interrupted Time-Series Regression Journal of Surgical Education	Quality improvement study with interrupted time-series regression.	PACU and ICU	139 Handoffs	Six Sigma methodology implementing an electronic handover increased completeness of handoff
2019	Argawala et al. Consensus Recommendations for the Conduct, Training, Implementation,	Qualitative discussions in cohorts Level VI	Conference	99 health care professionals	Engaging key stakeholders, performing team training, and

	and Research of Perioperative Handoffs Anesthesia & Analgesia				changing attitudes are crucial when implementing a new handoff process
2019	Halladay et al. Enhancing the quality of the anesthesia to postanesthesia care unit patient transfer through use of an electronic medical record- based handoff tool Journal of PeriAnesthesia Nursing	Quantitative, quasi-experimental study Level III	Duke PACU	300	The electronic handoff tool significantly increased the completeness of handoff
2019	Halterman et al. Use of a Checklist for the Postanesthesia Care Unit Patient Handoff. The use of a PACU handoff checklist can improve transfer of care by ensuring the provider receives more pertinent medical information during these transfers. Journal of PeriAnesthesia Nursing	Quality Improvement	PACU in Level 1 trauma in Eastern Georgia	209	The checklist decreased omission of vital information in handoff

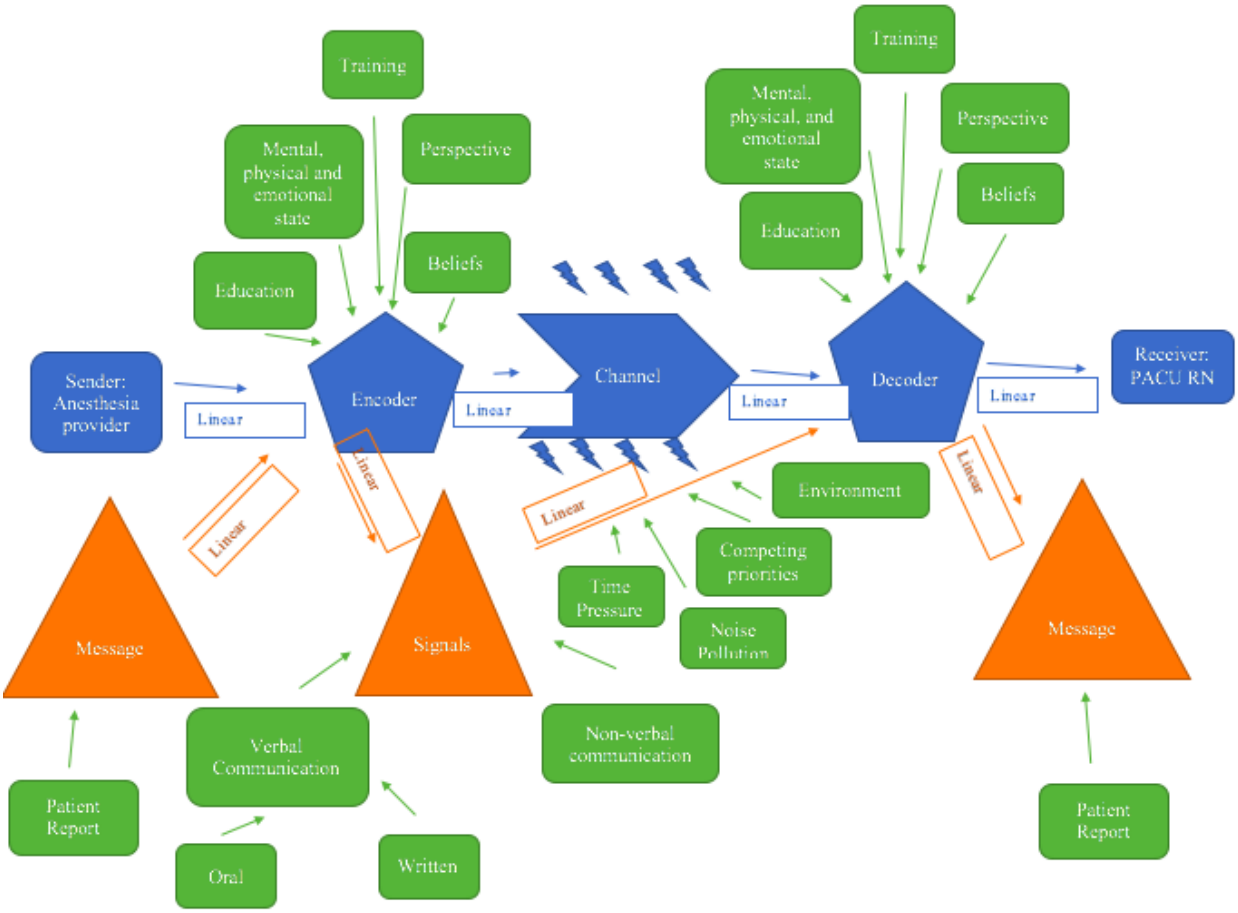
2019	Rose et al. Postoperative information transfers: an integrative review Journal of PeriAnesthesia Nursing	Integrative review of multiple quasi-experimental studies. Level III	PACU in North Carolina	17 Articles	Integrate key stakeholders for success with developing a handover tool
2020	Lopez-Parra et al. Cohort Study on the Implementation of a Surgical Checklist from the Operating Room to the Postanesthesia Care Unit Journal of PeriAnesthesia Nursing	Cohort Study Level IV	PACU	59 Handoffs	A written checklist decreases loss of important information and improves safety
2020	Pakcheshm et al. The impact of using "ISBAR" standard checklist on nursing clinical handoff in coronary care units. Nursing Practice Today	Quasi experimental Level III	Coronary Care Units	282 Handoffs	The ISBAR checklist significantly increased the relay of information in all areas of handoff
2020	Webster et al.	Single-center observational study Level VI	Cardiac OR to PACU	96 Handoffs	Noise and turn-taking account for a

	Noise and turn-taking impact postanesthesia care unit handoff efficiency. Journal of Patient Safety & Risk Management	large variance in handoff efficiency

Note. Applying the levels of evidence classification system adapted from "*Evidence-based practice in nursing and healthcare: A guide to best practice* (4th ed.)," by Melnyk, B. & Overholt, E. (2011), published by Wolters Kluwer in Philadelphia, Pennsylvania.

Appendix D

Applying the Shannon-Weaver Linear Communication Model to Anesthesia Handoff



Note. Applying the Shannon-Weaver Linear Communication Model to anesthesia handoff. The standard linear model includes the blue and orange shapes, and the green shapes are the factors that specifically influence anesthesia handoff. This handoff is from the anesthesia provider to the post-anesthesia care nurse. Adapted from "Establishing a Conceptual Framework for Handoffs Using Communication Theory," by M. Mohorek, and T. Webb, 2015, *Journal of Surgical Education, 72* (3), p. 404. Copyright 2015 by the Association of Program Directors in Surgery

Appendix E

Copy Approval to Perform Project

Quality Assurance/Quality Improvement Project vs. Human Research Study (Requiring IRB approval) Determination Form

This worksheet is a guide to help the submitter to determine if a project or study is a quality assurance/quality improvement (QA/QI) project or research study and is involving human subjects or their individually identifiable information and requires IRB approval as defined by the Health and Human Services (HHS) or Food and Drug Administration (FDA). Once completed, please email the form to the [redacted] enter for Research and Grants [redacted] CRG) CRG.Quality[redacted] A CRG team member will contact you with the results of their review and may request additional information to assist with their determination. The determination will be made in conjunction with the UMCIRB office.

Please contact the [redacted] CRG with any questions at 252-847-1177 or CRG.Quality[redacted]

For more guidance about whether the activity meets the definition of Human Subjects Research see https://rede.ecu.edu/umcirb/irb-faqs/definitions/ or https://www.hhs.gov/ohrp/regulations-and-policy/decision-charts-2018/index.html#c1

Project Title: Assessing anesthesia providers' perceptions of adequacy of postoperative PACU patient handoff communication		
Funding Source: None		
Project Leader Name: Reagan Atkins/ Maura McAuliffe	☐ Ed.D. ☐ J.D. ☐ M.D. ☐ Ph.D. ☐ Pharm.D. ■ R.N. ☐ Other(specify):	
Job Title: ECU SRNA/ECU CRNA Faculty	**Phone:** [redacted]	**Email:** mcauliffem@ecu.edu
	Primary Contact (if different from Project Leader): Reagan V. Atkins	
	Phone: [redacted]	**Email:** Atkinsr19@students.ecu.edu

Key Personnel/ Project Team members:

Name and Degree:	Department: (Affiliation if other than Vidant)	Email:
Reagan V. Atkins, BSN, SRNA	ECU Nurse Anesthesia Program	Atkinsr19@students.ecu.edu
Dr. McAuliffe, Chair, PhD, CRNA	ECU Nurse Anesthesia Program	mcauliffe@ecu.edu

QI/QA Assessment Checklist:

Consideration	Question	Yes	No
PURPOSE	Is the PRIMARY purpose of the project/study to: • IMPROVE care right now for the next patient? OR • IMPROVE operations outcomes, efficiency, cost, patient/staff satisfaction, etc.?	✓	
RATIONALE 1	The project/study falls under well-accepted care practices/guidelines or is there sufficient evidence for this mode or approach to support implementing this activity or to create practice change, based on: • literature • consensus statements, or consensus among clinician team	✓	
RATIONALE 2	The project/study would be carried out even if there was no possibility of publication in a journal or presentation at an academic meeting. (**Please note that answering "Yes" to this statement does not preclude publication of a quality activity.)	✓	
METHODS 1	Are the proposed methods flexible and customizable, and do they incorporate rapid evaluation, feedback and incremental changes?	✓	
METHODS 2	Are patients/subjects randomized into different intervention groups in order to enhance confidence in differences that might be obscured by nonrandom selection? (Control group, Randomization, Fixed protocol Methods)		✓
METHODS 3	Will there be delayed or ineffective feedback of data from monitoring the implementation of changes? (For example to avoid biasing the interpretation of data)		✓
METHODS 4	Is the Protocol fixed with fixed goal, methodology, population, and time period?		✓
RISK	The project/study involves no more than minimal risk procedures meaning the probability and magnitude of harm or discomfort anticipated are not greater in and of themselves than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests.	✓	
PARTICIPANTS	Will the project/study only involve patients/subjects who are ordinarily seen, cared for, or work in the setting where the activity will take place?	✓	
FUNDING	Is the project/study funded by any of the following? • An outside organization with an interest in the results • A manufacturer with an interest in the outcome of the project relevant to its products • A non-profit foundation that typically funds research, or by internalresearch accounts		✓

If all of the check marks are inside the shaded gray boxes, then the project/study is very likely QI and not human subject research. Projects that are not human subject research do not need review by the IRB.

rev. 12.2020

In order to assess whether your project meets the definition of human subject research requiring IRB review or may qualify as a quality improvement/assurance activity, please provide the following information:

1. Project or Study Summary:
   As a separate attachment, please provide a **summary of the purpose and procedures** as well address all of the following:
   a) The project question/hypothesis.
   b) The project design.
   c) Any interaction or intervention with humans.
   d) A description of the methods that will be used and if they are standard or untested.
   e) Specify where the data will come from and your methods for obtaining this data -please specify who/where (i.e. CRG will provide you with the data, or someone from a specific department will provide you with the data, or you will pull it yourself).
   f) Specify what data will be used and any dates associated with when that data was originally collected (i.e Patient Name, Diagnosis, Age, Sex), *if applicable, please attach your data collection sheet.*
   g) Where will the data (paper and electronic) for your project be stored? Please specify how it will be secured to protect privacy and maintain confidentiality. For paper data, please provide physical location such as building name and room number and that it will be kept behind double lock and key. For electronic data, please provide the file path and folder name network drive where data will be stored and specify that it is secure/encrypted/password protected. If using other storage location, please provide specific details.
   h) Please specify how long data will be stored after the study is complete? (Keep in mind that data collected/generated during the course of the project that includes protected health information (PHI) should have identifiers removed at the earliest opportunity.)
   i) Please specify how the collected data will be used (internal/external reports, publishing, posters, etc.).

   Please attach a summary and/or any other additional documentation describing your project

2. **If the Primary purpose of your project/study is for QA/QI, have you obtained approval from the operational leader within your department or health system:**
   ■ **Yes** [Please specify here whom and obtain their signature in the signature section below [redacted]
   ☐ **No** [Contact the appropriate operational leader for approval.]

Please note:

- By submitting your proposed project/study for QA/QI determination you are certifying that if the project/study is established to qualify as QA/QI project, you and your Department would be comfortable with the following statement in any publications regarding this project: "This project was reviewed and determined to qualify as quality improvement by the [redacted]nter for Research and Grants."
- If you are submitting a Poster to Media Services for printing, you will need to also submit this Quality Improvement Worksheet or proof of your IRB Application and IRB Approval.
- If the [redacted]CRG determines the activity is not human subject research, then any presentation, publication, etc. should not refer to the activity as "human subject research," "exempt research," or "expedited research."
- If you would like the [redacted]CRG to verify that a project/study is not human subject research, please provide this form completed with the summary of your activity and any additional information to the [redacted]CRG at CRG.Quality[redacted]m and the following will be completed and returned to you for your records.

NHSR vs. HSR Determination:

☒ **Not Human Subject Research:** The [redacted]RG has determined that based on the description of the project/study, approval by the IRB is not necessary. Any changes or modifications to this project may be discussed with the [redacted]CRG at that time to ensure those changes do not elevate the project to human research that would need IRB approval.

☐ **Human Subject Research:** This project/study requires review by the IRB prior to initiation. An application in the electronic IRB submission system should be submitted.

Approval Signatures:

Department (Site) Manager: [redacted] **Date:** [redacted]

VH CRG Reviewer: [redacted] **Date:** [redacted]

UMCIRB Office Staff Reviewer: [redacted] **Date:** [redacted]

Appendix F

Surveys

CRNA Pre-Intervention Survey

Do you currently use a systematic way (something you do for all cases) of providing report to the PACU nurses?

- ○ Yes
- ○ No

Do all the anesthesia providers in your department use the same "standardized handoff tool/checklist/mnemonic" to provide report to the PACU?

- ○ Yes
- ○ No

Please mark the answer that best describes the extent to which you agree or disagree with the following statements regarding the transfer of patient care from the OR to the PACU.

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
My current handoff process provides an efficient way to transfer information.	○	○	○	○	○
My current process provides a comprehensive way to transfer information.	○	○	○	○	○
I am satisfied with the transfer of care process I currently use.	○	○	○	○	○
The handoff process I currently use lends itself to communication errors.	○	○	○	○	○

CRNA Post-Intervention Survey

Please estimate how many times you used the assigned handoff tool when transferring care to the PACU (over the last two weeks)?

Please select the answer that best describes the extent to which you agree or disagree with the following statements regarding the transfer of patient care from the OR to the PACU.

I found the Anesthesia Patient Safety Foundation PACU Handoff Checklist to be:

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
Easy to use	○	○	○	○	○
An efficient way to organize the material communicated	○	○	○	○	○
A comprehensive way to organize the material communicated	○	○	○	○	○
Appropriate in length	○	○	○	○	○
DID NOT appreciably increase the time needed to give my PACU report	○	○	○	○	○
Lends itself to communication errors	○	○	○	○	○
Overall I was satisfied with this handoff tool	○	○	○	○	○

Comment on why you would/would not like to adopt **this tool** into your personal anesthesia practice

Please describe anything you would **change** about the handoff tool.

Are there any barriers that would prevent you from adopting a standardized handoff tool?

What is your level of enthusiasm for future use of this tool?

- ○ Strongly enthused
- ○ Enthused
- ○ Neutral
- ○ Not enthused
- ○ Strongly not enthused

PACU Nurse Post- Survey

Were the following areas addressed in the handoff?			
	Yes	No	N/A
Was the patient identified			
Allergies			
Antibiotics			
Intake/Output			
EBL			
Pain management			
Nausea management			
Any major concerns that might affect PACU care addressed			

1) Using this tool contributed to an efficient handoff.

Strongly Agree Agree Neutral Disagree Strongly Disagree

2) Using this tool contributed to a comprehensive handoff.

Strongly Agree Agree Neutral Disagree Strongly Disagree

3) Did you NEED to clarify information after transfer, by calling back the provider?

- ❑ Yes
- ❑ No

4) Would you like to see this particular handoff checklist process used in the future?

- ❑ Yes
- ❑ NO

Appendix G

APSF PACU Handoff Checklist

Figure 1. PACU Handoff Checklist

Patient	Patient Identification (Nameband check)	
	Time In	
	Allergies	
	Surgical Procedure and Reason for Surgery	
	Type of Anesthesia (GA, TIVA, regional)	
	Surgical or anesthetic complications	
	PMH and ASA Scoring	
	Preoperative Cognitive Function	
	Preoperative Activity Level (METs)	
	Limb Restriction	
	Preop Vitals	
Procedure	Positioning of Patient (if other than supine)	
	Intubation conditions (grade of view, airway, quality of bag mask ventilation, bite block?)	
	Lines/catheters (IVs, a-lines, CVSs, foley chest tubes, surgical drains, VP shunt)	
	Fluid Management	Fluids= EBL= UO=
Medications	Analgesia Plan - During Case, Postop Orders	
	Antiemetics Administered	
	Medications due during PACU (antibiotics, etc.)	
	Other Intra-Op Medications (steroids, antihypertensives)	

"Do you have any questions or concerns?"

Note. APSF PACU Handoff Checklist. From "Improving post anesthesia care unit (PACU) handoff by implementing a succinct checklist," by C. Potestio, J. Mottla, E. Kelley, and K. DeGroot, *APSF Newsletter, 20*(1), 13-14.

Appendix H

Project Timeline