Distribution Statement

Distribution A: Public Release.

The views presented here are those of the author and are not to be construed as official or reflecting the views of the Uniformed Services University of the Health Sciences, the Department of Defense or the U.S. Government.

Implementation of a Standardized Intraoperative Handoff Tool for Anesthesia Providers

Shayna DeBarros BSN, SRNA; A. Noël Wilhoit, BSN, SRNA; Sandra Bruner DNP, CRNA; William Sellers, DNP, CRNA; Kenneth Wofford, PhD, DNP, CRNA

Fort Belvoir Community Hospital, Virginia

Copyright Acknowledgement Statement

The authors hereby certify that the use of any original work by another author or copyrighted material used in the DNP project entitled: “Implementation of a Standardized Intraoperative Handoff Tool for Anesthesia Providers” is either appropriately cited within the manuscript or used with formal written permission of copyright release by the owner of the original work.

[redacted]

Shayna DeBarros, BSN, RN, MAJ, Army, DNP Nurse Anesthesia Program

Daniel K. Inouye Graduate School of Nursing

Uniformed Services University

April 2, 2019

[redacted]

A. Noël Wilhoit, BSN, RN, MAJ, Army, DNP Nurse Anesthesia Program

Daniel K. Inouye Graduate School of Nursing

Uniformed Services University

April 2, 2019

Final Report Abstract

Phase II Site: Fort Belvoir Community Hospital, Fort Belvoir, VA

Project Title: Implementation of a Standardized Intraoperative Handoff Tool for Anesthesia Providers

Authors: DeBarros, S. L.; Wilhoit, A.

Background: The Institute of Medicine identified poor quality of communication in healthcare as a contributing factor to poor patient outcomes. The handoff of care between anesthesia providers in the intraoperative environment is a critical period for thorough and accurate communication of patient information. Implementation of a standardized handoff tool can increase the quality of communication with a subsequent provision of safer patient care and decreased adverse outcomes.

Purpose: To implement and evaluate the use of a standardized intraoperative handoff tool for anesthesia providers to improve communication and patient safety during transitions of care.

Project Design: Prior to introducing the PATIENT tool, handoffs between anesthesia providers were observed to assess the current practice and the presence of any standardized process. Next, department-wide education and training was conducted on using the tool. Lastly, data was collected through direct observation and self-report on the use of the tool and the critical elements of the tool communicated during the handoff.

Analysis of the Results: An estimated 288 intraoperative transfers of care occurred during the observation period. The PATIENT tool was used for 61 intraoperative handoffs (21%): 35 direct observation and 26 self-reported. The most frequently communicated essential elements of the handoff tool: patient, procedure, history, anesthetic, narcotics: 100%; antibiotic, airway, allergies: 96%; IV: 95%. Least frequently reported: twitches 85%; other invasive devices 85%; temperature

80%; and ETCO2 ventilation 78%. The least frequently reported elements were similar between observed and self-reported groups.

Organizational Impact/Implications for Practice: Using an anesthesia-specific handoff tool enhances inter-provider communication during anesthetic transfers of care, and positively impacts patient safety by reducing the risk for miscommunication contributing to medical errors.

Organizational Impact/Implications for Practice: Implement the use of an anesthesia handoff tool at FBCH to enhance inter-provider communication during anesthetic transfers of care, reduce the risk of medical errors, and ultimately improve patient outcomes.

Introduction

Rising health care costs and increased frequency of surgical procedures and anesthetics administered each year prompted advisory organizations such as the Joint Commission and Institute of Medicine to examine communication processes during transitions of care as a means of improving the quality of care, containing costs, and preventing adverse patient events (The Joint Commission, 2007; Institute of Medicine, 2000). In 2007, the Joint Commission reported that 80% of medical errors were due to an inaccurate or incomplete transfer of information during patient handoffs (The Joint Commission). Miscommunication during patient handoffs is a pervasive problem in military and civilian health care environments alike. To address this issue, the Joint Commission and the World Health Organization launched multiple initiatives urging healthcare facilities to implement standardized handoff models designed to improve communication for patient safety (The Joint Commission, 2012). During the intraoperative course, a transfer of care, otherwise known as a "patient handoff", may take place to relieve anesthesia providers for breaks or shift change (Agarwala, Firth, Albrecht, Warren & Musch, 2015). A patient handoff is defined as "the transfer of professional responsibility and accountability for some or all aspects of care for patient or group of patients to another person or professional group on a temporary or permanent basis" (Hu, Yu, Wright, Fallacaro, & Ruan, 2016). Anesthesia providers need complete and accurate knowledge of the patient's demographics, anesthetic course, and postoperative plan to provide safe and effective anesthesia care. This information is obtained through a review of the patient's chart, one-on-one preoperative interview and physical exam, and close observation throughout the intraoperative period.

Conducting a safe patient handoff can be challenging in the dynamic perioperative environment because of simultaneous competing demands and distractions (Agarwala et al., 2015). Therefore, it is crucial that the handoff is clear and concise for effective communication (Agarwala et. al, 2015; Wright, 2013; Tan & Helsten, 2013). For the purpose of this review, we will focus solely on the quality of communication during transfers of care between anesthesia providers.

Significance of the Problem

The quality of communication during intraoperative transitions in care has wide-reaching implications within all health care systems. The scope of this problem impacts all patients who undergo surgery in the in-patient and out-patient settings within the military, federal, and civilian hospital. The quality of communication during anesthesia handoffs is defined by Saager et al. as having two essential components: transmission and retention (2014). Specifically, were all critical elements of the handoff accurately transmitted by the off-going staff, and was the on-coming staff able to accurately recall all the critical elements discussed (Saager et al., 2014). Similarly, Boat and Spaeth (2013) used accuracy and completeness of critical elements to measure the quality of communication. In their study, the quality of communication was distinguished by both anesthesia providers accurately addressing all the critical elements during anesthesia transitions of care. These studies provide a basis for objectively measuring the quality of communication as an essential aspect of patient safety.

The scope of this problem impacts all patients who undergo surgery in the in-patient and out-patient settings within the military, federal, and civilian hospital environments. Many surgical procedures require anesthesia. The National Institutes of Health estimates that over 60,000 people daily undergo general anesthesia for surgery (Wein & Contie, 2011). Rising health care costs and increased frequency of surgical procedures and anesthetics administered each year prompted

advisory organizations such as the Joint Commission and Institute of Medicine to examine communication processes during transitions of care as a means of improving the quality of care, containing costs, and preventing adverse patient events (The Joint Commission, 2007; Institute of Medicine, 2000).

Adverse outcomes can result in omissions of care, medication errors, delayed or inappropriate treatments, prolonged PACU stays, increased hospital days, and inefficient reworking (Robins & Dai, 2015). These adverse outcomes negatively impact a patient's morbidity and mortality by creating prolonged hospital stays that expose them to the increased risk of developing hospital-acquired infections, postoperative deep venous thrombosis, and delayed healing of the surgical site (Rosman, Rochminov, Segal, & Segal, 2015). Financially, preventable adverse outcomes place a significant burden not only on the health care facility in the civilian sector but military health care expenditures as well. A 2011 report from the Society of Actuaries estimated that over 17.1 billion dollars of healthcare costs are due to medical errors (Shreve, Van Den Bos, Gray, Halford, Rustagi, & Ziemkiewicz, 2010). These studies highlight the importance of improving intraoperative safety. One means of improving intraoperative safety is by enhancing the quality of communication during intraoperative transfers of care.

In the military health care system, effective communication during patient handoff is neither less essential nor less vulnerable to error. In a recent Patient Safety Culture Survey conducted in the National Capital Region, healthcare providers across all disciplines identified handoffs and transitions in care as an area of patient safety that needed improvement (Hurley, 2017). The results from this survey illustrate the global need for improvement in handoffs in all areas of patient care, including the intraoperative environment.

Patient handoffs are vulnerable periods during a patient's course of care because miscommunication during patient handoff is one of the leading causes of medical error (Hyder, et al, 2016; Saager et al., 2014). The occurrences and frequencies of handoffs have real-world implications for patients' health. One retrospective study examines the effect of multiple anesthesia handoffs and the frequency of adverse events. The study includes all patients classified as less than an American Society Anesthesiologists physical status classification V (ASA classification) undergoing elective colorectal surgeries under general anesthesia who present with postoperative adverse outcomes (Hyder et al., 2016). Adverse events are specifically defined as cardiac arrest, coma greater than 24 hours, unplanned intubation, ventilator use >24 hours, pneumonia, stroke, wound disruption, surgical site infection, sepsis, and systemic inflammatory response (Hyder et al., 2016). The authors report that with higher intensity surgery and an increase in transitions, the odds for a postoperative complication double (Hyder et al., 2016). In a separate study, Saager et al., (2014) retrospectively examined the incidence of postoperative adverse outcomes in all non-cardiac surgical patients at the Mayo Clinic. Similarly, this study illustrates that the risk of having a postoperative adverse patient outcome increases by 8% with each intraoperative handoff between anesthesia providers.

It would be ideal if one assigned anesthesia provider remained with their patient for the entirety of the surgical case (Saager et al., 2014). However, the duration of surgery, the unpredictability of the perioperative environment, the need for meal breaks, and shift schedules often necessitate a transfer of care between anesthesia providers (Saager et al., 2014; Wright, 2013). If critical information is not transferred along with the patient to the receiving provider, then continuity of care degrades. As a result, this unnecessarily exposes the patient to increased risk for an adverse outcome (Nagpal, Arora, Wong, Sevdalis, Vincent, & Moorthy, 2012). To

reduce the risk of medical errors during transitions of care, standardized checklists and protocols have been used to improve accuracy and completeness of information (Pucher, Johnston, Aggarwal, Arora & Darzi, 2015). Findings from studies support the use of a standardized handoff protocol as a means of reducing medical errors and improving patient safety during transfers of care (Wright, 2013; Boat et al., 2013). Appropriate tool development is imperative to avoid pitfalls in communication that can lead to adverse outcomes.

The first step in standardizing a handoff protocol is to identify the critical elements of the patient's history, intraoperative course, and postoperative plan that must be communicated to the receiving provider. A patient handoff should contain critical elements that give the oncoming anesthesia provider a succinct, yet thorough picture of the patient (Wright, 2013; Boat et al., 2013). The handoff elements should include information for the oncoming provider to fully assume care without risk of harm to the patient. In the literature there are multiple variations of handoff tools and their respective critical elements (Wright, 2013; Boat et al., 2013; Gillikin & Apatov, 2016; Agarwala et al., 2015). Many of the elements of these checklists originate from large-scale survey results compiled from anesthesia providers nationwide. The most common checklist elements include patient demographics, medical history, procedure, position, anesthesia, antibiotic, airway, allergies, invasive lines, input and output of fluids, medications, and postoperative plan disposition (Wright, 2013; Boat et al., 2013; Gillikin et al., 2016; Agarwala et al., 2015). Although there is variability between checklists, the outcomes of each study consistently show improvement of communication between anesthesia providers when checklists are utilized. The implementation of a standardized handoff tool demonstrates improved provider-to-provider communication, thus preventing communication errors that potentially lead to adverse outcomes.

Clinical Question

Does utilizing a standardized anesthesia handoff tool during intraoperative transfer of care between anesthesia providers impact the quality of communication, defined as the transfer of essential components of patient information, between anesthesia providers?

Focus Areas

This project was comprised of three focus areas. The first focus area assessed the baseline practice of intraoperative handoffs between providers before implementation of the PATIENT handoff tool. The second focus area was training anesthesia providers on use of the handoff tool to produce a cohesiveness for standardized handoff communication across the department. The third focus area directly assessed for any changes in communication and the extent of the implementation of the anesthesia handoff tool.

Relevance to Military Nursing

This problem impacts all patients undergoing surgical procedures requiring anesthesia services within the civilian and military health care systems. Decreasing errors during patient handoffs relate to two of the four goals of the Military Healthcare System's "Quadruple Aim" initiative; specifically, the goals to provide a better experience of care and decrease per capita healthcare costs (Defense Health Agency & Military Health System, 2014). Whether in a deployed austere setting or a major medical center, conducting a structured anesthesia provider handoff has the potential to reduce patient morbidity and mortality, leading to enhanced patient satisfaction and reduced health care costs (Russ, Rout, Sevdalis, Moorthy, Darzi, & Vincent, 2013). From a financial perspective, implementing a standardized handoff tool may be a cost-effective method for mitigating untoward and costly adverse medical errors. The application of

safety tools such as surgical checklists and anesthesia machine checklists have been shown to improve safety and patient outcomes (Thomassen, Storesund, Søfteland, & Brattebø, 2013; Russ et al., 2013; Robins et al., 2015; Pucher et al., 2015). Similarly, anesthesia-specific handoff tools have been shown to enhance inter-provider communication during anesthetic transfers of care, thereby reducing the risk of medical errors and ultimately improving patient outcomes (Wright, 2013; Boat & Spaeth, 2013; Canale, 2018). Lastly, employing a standardized patient handoff tool aligns with the Military Healthcare System's mission to develop common standards and processes to improve the quality of care and patient safety across all environments (DHA & MHS, 2014).

As one of the primary anesthesia providers in the country, nurse anesthetists have an integral role in ensuring effective communication during transfer of care between anesthesia providers. As stated by the "Standards of Nurse Anesthesia Practice", it is the nurse anesthetist's duty to "evaluate the patient's status and determine when it is safe to transfer the responsibility of care" (American Association of Nurse Anesthetists, 2013). This includes "accurately reporting the patient's condition, including all essential information, and transfer the responsibility of care to another qualified health care provider in a manner that assures continuity of care and patient safety" (AANA, 2013). Accordingly, implementing a standard communication tool not only assists anesthesia providers in adhering to the standard of care, but can also reduce unnecessary variance in communication (Wright, 2013). Ultimately, standardizing handoff processes may result in reducing medical errors and improve patient safety.

Organizing Framework

For this quality improvement project the authors used the Iowa Model for Evidenced-Based Practice as the framework to develop and implement an anesthesia-specific handoff tool (Titler, Kleiber, Steelman, Rakel, Budreau, Everett, & Buckwalter, 2001).

Project Design

General Approach

This quality improvement project's aim was to improve the quality of communication between anesthesia providers during intraoperative transitions in care. Guided by the Iowa Model framework and results from our literature search, we initially addressed the problem by evaluating current local handover practices and provided education and training on standardized communication with the use of an anesthesia-specific handoff tool. Then we measured for changes in the quality of communication after introducing the handoff tool and its influence on creating a standardized method for conducting anesthetic handoffs. Implementing the PATIENT handoff tool coupled with staff education on safe communication practices provided a provision of safer patient care and decreased adverse outcomes.

Evidence Evaluation

A literature review was conducted based on our PICOT question utilizing databases MEDLINE, Web of Science, ProQuest, CINAHL, EMBASE and Google Scholar. We conducted a Boolean search string with the following terms: "anesthesia provider", "CRNA", "anesthesiologist", "nurse anesthetist", "intraoperative", "patient handoff protocol", "patient handoff tool", "communication", "transfer of care", "handover", "continuity of patient care", and "safety". Our search was limited to include articles published after 2007 in the English language

and only included human subjects. We specifically chose this publication year because in 2007 the Joint Commission required hospitals to implement a standardized handoff communication approach during transitions of care (The Joint Commission, 2007). As a result, more research and information was generated in developing protocols and handoff tools. As of January 2018, our search strategy yielded 1,256 articles. We screened all of the articles for titles and abstracts that related to our inclusion criteria. Our inclusion criteria consisted of studies that examined the utilization of handoff tools or protocols and their effect on communication outcomes between anesthesia providers in the intraoperative environment and included all patient populations, surgical procedures, and forms of communication, such as verbal, electronic, and handwritten. We excluded articles that examined patient transfers that were not solely between anesthesia providers, or took place outside of the intraoperative environment i.e. postoperative care unit, intensive care unit.

This yielded 27 articles that are relevant to our PICO question that met our inclusion criteria. Next, we appraised the remaining four articles using the STROBE and SQUIRE 2.0 guidelines published on EQUATOR Network (UK EQUATOR Centre, n.d.), as appropriate, based on the study design. In addition, we also used the Critical Appraisal of Cross-Sectional Survey Study Checklist published by the Center for Evidenced-Based Management to evaluate Wright's descriptive survey study (2013). Upon evaluating these articles, we cataloged the research data into a matrix to compare and contrast the findings, and determine the implications for our PICO.

Evidence Synthesis and Analysis

For the given level of evidence, we deemed the overall quality of these articles to be adequate for their study design. Each article clearly and concisely stated the purpose and design

of their study. Additionally, they used an appropriate design and methodology to evaluate their hypothesis and answer their clinical question. However, because two of our articles lacked sufficient detail in certain critical elements the overall quality suffered. Specifically, the study by Wright (2013) had failed to discuss limitations and the impact of the results of the study. Similarly, the study by Boat et al. (2013) lacked specifics in their results analysis and how they compiled and measured their data. Comparatively, the articles by Gillikin et al. (2016) and articles by Agarwala et al. (2015) were stronger in that these studies comprehensively discussed their methodology and results. Additionally, the authors also identified several limitations within each study and their efforts to minimize their impact.

While many authors have highlighted the association between intraoperative handoffs and adverse patient outcomes, only four articles specifically encompassed our clinical question. Although there were not many articles that specifically examined anesthesia handoff tools, the consistency of their results provides our group with sufficient evidence to support the use of a standardized handoff tool among anesthesia providers. Additionally, the articles provided a common framework for universal critical elements that should be incorporated into the handoff tool.

While there are no research studies that conclusively suggest that using an anesthesia handoff tool reduces adverse patient outcomes, there are numerous studies that consistently identify poor communication during transfers of care as one of the leading risk factors for sentinel events (Gillikin et al., 2016; Institute of Medicine, 2000; Joint Commission, 2007). This highlights an existing gap in the literature, identifying whether or not the lack of a standardized transfer of care protocol, such as a patient handoff tool, could lead to patient harm. To bridge the gap between handoff tools and adverse outcomes**,** these studies use a standardized anesthesia

handoff tool as a means to improve communication during intraoperative patient transfers of care (Gillikin et al., 2016; Boat et al., 2013; Agarwala et al. 2015; Wright, 2013). Although all four articles have varied study designs, the anesthesia handoff tools within each study shared similar formatting and critical elements. These studies uniformly demonstrate that using a standardized anesthesia handoff tool preserves continuity of care by reducing variance, and reduces omissions and inaccuracies during anesthesia transfers of care (Wright, 2013; Gillikin et al., 2016; Boat et al., 2013; Agarwala et al., 2015). Furthermore, the results consistently showed improved quality of communication between anesthesia providers when using an anesthesia handoff tool (Gillikin et al., 2016; Boat et al., 2013; Agarwala et al. 2015; Wright, 2013). Therefore, a standardized anesthesia handoff tool can be used as means of improving communication during transfers of care. As a result of improved communication, anesthesia providers can reduce anesthesia-related adverse outcomes and enhance patient safety during intraoperative transfers of care.

Setting

The quality improvement project was conducted at Fort Belvoir Community Hospital in northern Virginia, which consisted of ten main operating rooms and two satellite surgical sites within the facility to include urology and labor and delivery. There were approximately 30 providers in the anesthesia department, consisting of both anesthesiologists (MDA) and certified nurse anesthetists (CRNA). We implemented observation of the handoff tool use solely within the main operating rooms where the majority of turnovers occurred. This allowed for a greater likelihood of observations due to the closer proximity of rooms and higher volume of surgical cases.

Procedural Steps

Phase I: Pre-Implementation Phase. The pre-implementation phase of this project focused on gaining a baseline understanding of current handoff practices utilized within the facility and gauging provider attitudes towards standardized anesthesia handoff protocols. To evaluate current intraoperative handoff practices, we directly observed anesthesia transfers of care, specifically noting if 1) a handoff occurred and 2) if a protocol such as IPASS or another standardized handoff protocol was utilized. This measurement consisted of 60 unannounced observations without the use of a formal audit evaluation tool.

Phase II: Staff Education and Acclimation. The second phase focused on increasing anesthesia staff awareness of the patient safety consequences of poor communication, and increasing staff knowledge of the PATIENT protocol. This phase occurred over a four-week period. The first two weeks consisted of department-wide staff education and training on the handoff tool via weekly staff meetings, email distribution of training materials, and one-on-one training as needed. The training was presented in PowerPoint format and lasted approximately 15 minutes. The focus of this presentation was to raise awareness of the safety risks associated with inadequate patient care transfers, and educate staff on the PATIENT protocol as a means to standardize communication during anesthesia handoffs to improve patient safety. To garner support from key stakeholders, including the departmental head, assistant, and anesthesia staff providers, the presentation included support from literature and from the author of the PATIENT protocol. After formal staff education, there was a two-week transition period to allow staff to acclimate to this new handoff process, and to practice incorporating it

within their anesthesia practice. To facilitate this process, we distributed laminated anesthesia handoff badge cards and posted the handoff tool checklist next to the anesthesia machine to serve as a visual prompt during handoffs.

Phase III: Implementation and Data Collection. The implementation phase consisted of data collection through direct and indirect observations of anesthesia transitions in care utilizing the PATIENT tool. The purpose of direct observation was to assess the quality of communication with the use of the tool during anesthesia handoffs. The purpose of incorporating indirect observations into our data analysis metrics was to have form completion serve as a proxy for knowledge transfer during the handoff process. By utilizing both direct and indirect observations we were able to measure both the actual knowledge transfer (direct) and form completion (indirect) to achieve our overall outcome: to educate anesthesia providers on methods to improve handoff communication through the use of an anesthesia handoff checklist tool. Data collection began after the two-week acclimation period. Over a four-week period we directly observed handoffs between anesthesia providers during breaks, lunch breaks, and change of shift. Direct observations were unannounced and randomized according to a coin flip: heads will be odd numbered operating rooms, tails will be even number operating rooms. Observers used a checklist audit tool containing all the critical elements of the handoff tool, assessing for its frequency of use and completeness of the tool (see Appendix A). For indirect observation, participating off-going staff completed an anonymous paper self-audit tool (see Appendix B). To maintain anesthesia provider anonymity the self-audit tools did not contain any personally identifying information. Participants deposited

their self-audits in a discrete central location. The self-audit tool was identical to the observers audit tool to ensure valid and consistent measurement.

Data Collection and Analysis. Our sample size consisted of approximately 30 anesthesia providers including anesthesiologists and nurse anesthetists with a range of 2-34 years' experience. Our outcome (dependent) variables included the PATIENT handoff tool and their individual critical elements: procedure, patient, pertinent history, position, anesthesia, antibiotics, airway, allergies, temperature, IV, invasive devices, end tidal CO2 (ventilation), narcotics, and twitches. The dependent variables included the use of the PATIENT handoff tool, and the quality of communication between anesthesia providers during transitions in care. Data analysis methods included compiling results for direct and indirect observations and comparing the frequency of use of the PATIENT tool and communication of all 14 critical elements. We utilized basic descriptive statistics to analyze the collected data.

HIPAA Concerns

In regards to protection of patient privacy and information, this project's procedural steps were designed to minimize HIPAA concerns while still gathering meaningful data to evaluate the use of the handoff tool between anesthesia providers. Although observation sessions took place during patient care, observers strictly monitored for the essential elements of the handoff tool. Observers did not record any patient specific data, or access patient chart information. In an effort to protect the privacy of anesthesia provider participants and mitigate fear of reprisal or punishment for poor communication practices, observers did not record any demographic or identifiable provider data during observation sessions. To further maintain anesthesia provider

anonymity, self-audit tools utilized for indirect observations did not contain any identifying information.

To simultaneously protect the fidelity of the observations while ensuring patient safety, observers planned on only intervening during turnover if they witnessed an unsafe act that puts the patient in imminent danger i.e. failing to communicate difficult airway/intubation, history of malignant hyperthermia, true allergy to opioids, etc. This never occurred, and the observers maintained their discrete role.

Project Results

Through retrospective review of the operating room schedule, it was calculated that 288 possible intraoperative transfers of care occurred during the data collection period. This approximated two handoff possibilities (morning break and lunch) per day, accounting for one inclement weather day that lead to the closure of the operating rooms. During this period, the PATIENT handoff tool was used 21% of the time (n=61). Of the assessed handoffs, there were 35 direct observations, 29 handoffs (90%) used the PATIENT tool, and 6 (10%) did not. Indirect observation (self-report form of handoff tool) yielded a total of 26 uses. The authors omitted the total percentage of use (n=288) from the self-report because our numerator was derived.

The authors also analyzed the individual components discussed for both observed and self-reported intraoperative handoffs when participants utilized the handoff tool. The most frequently reported components were patient (100%), procedure (100%), history (100%), anesthetic (100%), antibiotic (96%), airway (96%), allergies (96%), IV (95%), and position (93%). The least frequently reported critical components were twitches (85%), other invasive devices (85%), temperature (80%), ETCO2 ventilation (78%). When comparing the critical components, the items least frequently reported were similar between the observed and self-

reported: twitches (86% vs 84%); temperature (86% vs 73%), ETCO2 ventilation (83% vs 73%) and other invasive devices (78% vs 69%).

Analysis of Results

Since 2007, the implementation of innovative patient safety solutions and prevention of handover error has been an established goal of healthcare regulatory organizations including the World Health Organization, the Joint Commission, and the Commonwealth Fund (Manser & Foster, 2011; The Joint Commission, 2012). Similarly, the Military Healthcare System's Quadruple Aim Initiative aligns with these patient safety goals supporting the use of standardized checklists for improving communication and reducing medical errors (Defense Health Agency & Military Health System, 2014). In recognizing these goals and the lack of standardization during intraoperative anesthesia handoffs, the authors sought to enhance communication during intraoperative handoffs by educating and implementing a standardized intraoperative handoff checklist tool.

In the study published by Boat and Spaeth, the authors found that anesthesia providers perceived that their handoffs were "excellent" prior to the implementation of a handoff tool, despite the lack of standardized communication and variation between each provider's communication style (2013). Comparatively, anesthesia providers at Fort Belvoir consistently conducted intraoperative handoffs, however there was no reported or observed utilization of a standardized handoff checklist and techniques varied widely between anesthesia providers. We observed variation in the communication of information during handoffs related to the personality of the anesthesia provider, type of surgery, presence of interruptions, level of noise, level of light, and time constraints. The majority of providers practiced a verbal handoff technique with the open electronic anesthesia record visible between providers, while other

providers utilized a note-taking technique. After one month of direct observation and indirect data collection via a self-report tool, our results demonstrated that standardized communication increased by 21%, and thereby reduced the risk of inadvertent error and adverse patient outcome associated with patient transfers of care. According to a study published by Saager et al, morbidity and mortality increased by 8% with each intraoperative handover (2014). Additionally, Hyder et al. discovered an increase in patient adverse outcomes when an increase in number of anesthesia provider handoffs occurred during a single surgery (2016). An increase in standardized checklist use within the one-month period at our facility lead to decreased gaps in communication and, although not directly measured, an overall decrease in the risk of morbidity and mortality for surgical patients.

In reviewing the individual critical elements not reported during handoff, both the self-report and direct observation data yielded similar results. The authors believe recurrent omission of the critical elements' twitches, temperature, ETCO, and other invasive devices was multifactorial. Firstly, the common omission of temperature and end-tidal CO2 may have been the result of an assumption by the communicating provider that the elements did not require verbal communication because they were displayed on the monitor in close proximity during the handover. Secondly, omission of the checklist elements twitches and other invasive devices may have occurred during monitored anesthesia cases. Despite inconsistent tool use, the overall feedback on the handoff tool from the anesthesia department was positive. It reflected the need to consider integration of the tool within the anesthesia electronic healthcare record and to further customize the tool with feedback from the department in conjunction with evidence-based literature.

Limitations

Several limitations for this study were identified. Some of the limitations in this project were inherent to the project design itself, including the Hawthorne effect/observer effect during direct observation sessions as well as volunteer bias in using self-report forms to measure non-observed handoffs. Given the variability of checklist use and critical components communicated during both observed and unobserved sessions, it is unlikely that these biases strongly influenced the outcome of this project. Thereby, results of this project can provide a foundation for future projects in providing guidance for adopting the handoff checklist tool for local use, as well as integrating its standardization into formal permanent department protocol.

Furthermore, the specific critical elements of observed handoffs were not collected during the pre-implementation observation phase, and therefore making it difficult to compare the content of handoffs pre and post-implementation. Because the focus of this project was to provide a systematic handoff process in the form of a checklist tool, the authors specifically chose a checklist tool with critical elements that had 1) already been validated 2) contained the required critical elements per the literature. Therefore, gathering data on the content of handoffs pre-checklist tool implementation was not entirely pertinent to the aim of this project and only provided redundant information. Certainly, providers may have relayed the same critical components as the PATIENT handoff tool, albeit it was not in a systematic format. Measuring and correlating the content of anesthesia handoffs before and after handoff checklist tool implementation certainly is a helpful technique, and may be used in future extensions of this project to create an anesthesia handoff checklist, or further customize the PATIENT handoff tool.

Organizational Impact

As recommended by various patient safety organizations, including the Joint Commission, the Anesthesia Patient Safety Foundation, and the US Department of Defense Patient Safety Program (PSP), all transfers of care should be conducted in a standardized fashion to reduce medical errors caused by communication breakdown and to improve patient safety (Joint Commission, 2012; Greenberg, 2017; DoD Patient Safety Program, n.d.). Although the Fort Belvoir transfer of care policy aligned with DoD PSP policy by employing the IPASS format, there was no observed use of a standardized process during intraoperative handoffs. Furthermore, feedback from current anesthesia literature suggests that utilizing an anesthesia-specific handoff checklist during intraoperative transfers of care enhances the quality of communication by providing a more comprehensive and specific assessment of the patient's anesthetic course and future disposition (Wright, 2013; Argwala et al., 2015; Boat et al., 2013; Gilikin et al., 2016; Gibney, Lee, Aquino, & Feczko, 2017). In an effort to improve communication during anesthestic transfers in care at Fort Belvoir, this project introduced an anesthesia-specific communication tool as a guide for standardizing the handoff process. The implementation of this project impacted the local organization on several levels. Firstly, it provided baseline data for handover practices, and identified the need for a communication tool to standardize the handoff process. Secondly, it provided an opportunity to raise awareness of the impact poor handovers have on patient safety, and educate anesthesia providers on the PATIENT handoff tool as a means to mitigate gaps in communication during transitions in care. Thirdly, the use of a standardized handoff tool during intraoperative transfers of care increased from zero to 21% after introducing the handoff tool. The increased use of the handoff tool enhanced communication between providers by providing a structured process for complete and accurate

transfer of critical patient information. The reduced variance between providers enhanced continuity of care and improved patient safety by reducing the risk for medical errors resulting from misinformation. Lastly, the post implementation results provided insight into optimizing communication tool content for local use, improving staff adherence, and guidance for future implementation strategies.

Implications to Practice & Policy

Since the implementation of this project, several new articles have been published on the topic of communication during intraoperative transfers of care. Their implications for practice and policy are discussed briefly, and have been included as recommendations for future project development.

Discerning the ideal implementation strategy is challenging as there is little published literature that examines the effectiveness of specific implementation techniques that best facilitate user adoption and adherence (Agarwala & Lane-Fall, 2017). The Joint Commission offers a framework that provides guidance and recommendations for implementation strategies for standardized handoffs within their Targeted Solutions Toolkit. (Joint Commission, n.d.). This toolkit has been successfully used to implement standardized handoffs procedures in a variety of patient care environments, however, its broad framework should be tailored for the needs of the facility and the intraoperative environment. Specifically, their recommendations include standardizing the content, educating and coaching awareness of the issue, allowing the opportunity to ask questions, hardwiring the process within the system, and reinforcing through quality and measurement (Joint Commission, n.d.). This project did accomplish several of the aforementioned objectives including providing staff education and awareness of the issue, introduced a standardized handoff tool, and provided an opportunity for staff to ask questions

and give feedback through informal query. This laid the groundwork to further strategy implementation in areas including tailoring the handoff tool to local use, hardwiring the handoff process, and developing a system for quality assurance and measurement.

While this project introduced a tool that standardized critical content, the results suggested that further tool customization may be warranted. Feedback from staff in the form of a formal survey can accomplish several aims proposed by the Joint Commission Targeted Solutions Toolkit. A formal survey provides an opportunity for staff to ask questions, and contribute suggestions for handoff tool customization and strategy implementation within the electronic healthcare record. Furthermore, the survey can also act as vehicle for garnering support and buy-in from key stakeholders. Once tool customization is completed, a formal policy for its use during intraoperative handoffs can be developed and integrated into standard local practice. In combination with policy development, providing training and education sessions at regular intervals for new staff can help maintain vigilance of the issue and sustain a culture of safety.

In conjunction with developing the ideal checklist tool, it is equally important to adopt a strategy for the hardwiring process so that it is provider-friendly and augments anesthesia workflow. Having the perfect checklist tool is useless if the end-user feels that it is too cumbersome to integrate within their practice. Because the on-coming anesthesia provider routinely signs into the electronic healthcare record during transfers of care, we recommend integrating the handoff checklist tool into this portion of the electronic anesthesia record. Configuring the checklist within the electronic record at this juncture serves as a visual aid prompt for the off-going provider and can reduce the potential for omitting critical elements. Furthermore, there are several studies that support the integration of an anesthesia handoff tool

into the anesthesia electronic record. Apatov and Gilikin observed a significant decrease in the number of inaccurate and omitted critical elements after introducing an electronic version of their anesthesia handoff tool (2016). Agarwala et al. (2015) reported increased frequency of anesthesia handoff tool use (35%-74%) and improved transfer and retention of critical patient information in all categories (from an average 50% to 85%) after integrating an anesthesia handoff checklist into their anesthesia information management system (AIMS). Furthermore, 75% of anesthesia providers felt that the introduction of the electronic checklist improved the quality of their communication and reported higher satisfaction with their handoff practice (Agarwala et al., 2015). Another interesting aspect to this study was their AIMS system was able to derive the checklist critical elements and auto populate these items on their signout page, thereby enhancing the accuracy and smoothness of the transition. In summary, imbedding an electronic version of the checklist on the signout page has shown to improve adherence and the quality of communication, and warrants consultation with the local vendor for optimal configuration into Fort Belvoir's electronic anesthesia record.

Finally, developing a system for quality assurance and measurement supplements hardwiring the process and facilitates accountability and sustainability for policy and practice. Performance measures for continuous quality improvement can be accomplished by including a "transfer of care" item on the quarterly peer review evaluation forms. Several studies suggest peer evaluation as a strategy for assessing and improving provider transfer of care performance. Survey results from studies conducted by Canale, Wright, and Gibney convey that anesthesia providers acknowledge the importance of this topic, and that conducting safe intraoperative handoffs it is an important aspect of one's quality of anesthesia care (Wright 2013; Canale, 2018; Gibney et al., 2017). However, as described by Boat and Spaeth, it can be challenging for

providers to acknowledge areas of self-improvement, and “our perception of how we perform is not always supported by the data” (2016). In fact, their pre-implementation survey reported that a large majority of anesthesia providers felt that their handoffs were excellent prior to implementing their standardized handoff tool (Boat and Spaeth, 2013). Formal audit of checklist use on the peer review evaluation form can provide objective feedback to individual anesthesia providers on areas for improvement in their transfer of care practices, as well as reinforce handoff protocol adherence. Another option for measuring continuous quality assurance would be to conduct random direct observation for checklist tool use and completeness while awaiting integration of the handoff tool into the electronic anesthesia record.

Future Directions for Research and Practice

Optimizing communication during intraoperative transfers of care continues to be a topic of interest in the anesthesia community. Current literature has made it clear that the use of a communication checklist tool compared to the use of no tool improves the quality of communication during the handoff process. Yet, there are no studies comparing one tool versus another. Future studies comparing standardized handoff tools can aid in teasing out the optimal format and criterion for anesthesia-specific handoff tools (Argwala & Lane-Fall, 2017). Furthermore, discerning the ideal implementation strategy is challenging as there is little published literature that examines the effectiveness of specific implementation techniques that best facilitate user adoption and adherence (Argwala & Lane-Fall, 2017). Future studies testing the different types of implementation strategies can provide insight into various frameworks for successful integration into practice.

Conclusion

Implementing change in communication practices during anesthetic transfers of care continues to be a challenging issue. With current evidence-based literature supporting the use of standardized handoff tools, optimizing implementation and sustainment of an anesthesia-specific handoff process can be an inexpensive and effective means for improving patient safety in the perioperative environment. As stewards of patient safety, it is important to continually strive to work towards improving the handoff process to reduce the risk of inadvertent patient harm. Enhancing communication through the use of an anesthesia handoff tool reinforces appropriate handoff practices and can positively impact the military healthcare system by reducing the risk of adverse patient outcome, increasing workflow productivity, and reducing healthcare costs.

References

Agarwala, A. V., Firth, P. G., Albrecht, M. A., Warren, L. & Musch, G.. 2015. An Electronic Checklist Improves Transfer and Retention of Critical Information at Intraoperative Handoff of Care. Anesthesia and Analgesia 120: 96-104. doi: 10.1213/ane.0000000000000506.

Agarwala, A & Lane-Fall, M. (2017). The evidence base for the optimal conduct of handoffs. *Anesthesia Patient Safety Foundation Newsletter*. Vol 32, No. 2. Retrieved from: https://www.apsf.org/article/the-evidence-base-for-optimal-conduct-of-handoffs/

American Association of Nurse Anesthetists. (2013). Standards for Nurse Anesthesia Practice. Retrieved from https://www.aana.com/resources2/professionalpractice/Documents/PPM Standards for Nurse Anesthesia Practice.pdf

Boat, A. C., & Spaeth, J. P. (2013). Handoff checklists improve the reliability of patient handoffs in the operating room and postanesthesia care unit. *Paediatr Anaesth, 23*(7), 647-654. doi:10.1111/pan.12199

Canale, M. (2018). Implementation of a standardized handoff of anesthetized patients. *AANA Journal, 86,* 2, 137-145. Retrieved from https://www.aana.com/docs/default-source/aana-journal-web-documents-1/implementation-of-a-standardized-handoff-of-anesthetized-patients-april-2018.pdf?sfvrsn=f9505fb1_4

Center for Evidence Based Management (July, 2014), Critical Appraisal Checklist for Cross-Sectional Study. Retrieved (February 2017) from https://www.cebma.org

Defense Health Agency & Military Health System. *Secretary of Defense Military Health System Review Final Report* (Rep.). (2014, August). Retrieved http://www.health.mil/Military-Health-Topics/Access-Cost-Quality-and-Safety/MHS-Reviewhttp://www.health.mil/Military-Health-Topics/Access-Cost-Quality-and-Safety/MHS-Review

Department of Defense Patient Safety Program (n.d.) Quality and safety of healthcare for healthcare professionals. Retrieved from: https://health.mil/Military-Health-Topics/Access-Cost-Quality-and-Safety/Quality-And-Safety-of-Healthcare

Gibney, C., Lee, Y.-M., Aquino, E., & Feczko, J. (2017). A needs assessment for development of the TIME anesthesia handoff tool. *AANA Journal, 85,* 6, 431-437. Retrieved from https://www.aana.com/docs/default-source/aana-journal-web-documents-1/a-needs-assessment-for-development-of-the-time-anesthesia-handoff-tool-December-2017.pdf?sfvrsn=224041b1_4

Gillikin, K., & Apatov, N. (2016). The Effectiveness of an Anesthesia Handoff Tool: An Electronic Health Record Application to Enhance Patient Safety. *Anesthesia EJournal, 4*(1). Retrieved from http://anesthesiaejournal.com/index.php/aej/article/view/45

Greenberg, S. (2017). Handoff communication: an APSF safety initiative and perioperative provider concern. *Anesthesia Patient Safety Foundation Newsletter.* Vol 2, #32. Retrieved from: https://www.apsf.org/article/handoff-communication-an-apsf-safety-initiative-and-perioperative-provider-concern/

Hu, J., Yu, L.,Wright, S., Fallacaro, M., & Ruan, H. (2016). A systematic review on the interventions to improve intraoperative patient handoffs between anesthesia providers during surgery. PROSPERO 2016:CRD42016042540. Retrieved from http://www.crd.york.ac.uk/PROSPERO_REBRANDING/display_record.asp?ID=CRD42016042540

Hurley, C. "Patient Handoff Safety Survey." Message to the author. 11 Jan. 2017. E-mail.

Hyder, J., Bohman, J, Kor, D., Subramanian, A., Bittner, E., Narr, B. & Montori, V. (2016). Anesthesia Care Transitions and Risk of Postoperative Complications. *Anesth Analg, 122*(1), 134-144. doi:10.1213/ANE.0000000000000692

Institute of Medicine. (1999). “To err is human: building a safer health system”. National Academy of Sciences. Retrieved from: http://www.nationalacademies.org/hmd/~/media/Files/Report%20Files/1999/To-Err-is-Human/To%20Err%20is%20Human%201999%20%20report%20brief.pdf.

LoBiondo-Wood, G., & In Haber, J. (2014). Nursing research: Methods and critical appraisal for evidence-based practice.

Manser, T., & Foster, S. (2011). Effective handover communication: an overview of research and improvement efforts. *Best Pract Res Clin Anaesthesiol, 25*(2), 181-191. doi:10.1016/j.bpa.2011.02.006

Nagpal, K., Arora, S., Vats, A., Wong, H. W., Sevdalis, N., Vincent, C., & Moorthy, K. (2012). Failures in communication and information transfer across the surgical care pathway: Interview study. *BMJ Qual Saf BMJ Quality & Safety, 21*(10), 843-849. doi:10.1136/bmjqs-2012-000886

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

Robins, H. M., & Dai, F. (2015, August). Handoffs in the Postoperative Anesthesia Care Unit: Use of a Checklist for Transfer of Care. *AANA Journal, 83*(4). Retrieved from http://www.aana.com/newsandjournal/20102019/handoffs-pacu-0815-pp264-268.pdf

Rosman, M., Rachminov, O., Segal, O., & Segal, G. (2015). Prolonged patients' In-Hospital Waiting Period after discharge eligibility is associated with increased risk of infection, morbidity and mortality: a retrospective cohort analysis. *BMC Health Serv Res, 15*, 246. doi:10.1186/s12913-015-0929-6

Russ, S., Rout, S., Sevdalis, N., Moorthy, K., Darzi, A., & Vincent, C. (2013). Do Safety Checklists Improve Teamwork and Communication in the Operating Room? A Systematic Review. *Annals of Surgery, 258*(6), 856-871. doi:10.1097/sla.0000000000000206

Saager, Leif, Hesler, Brian D., You, Jing, Turan, Alparslan, Mascha, Edward J., Sessler, Daniel I. & Kurz, Andrea. 2014. Intraoperative Transitions of Anesthesia Care and Postoperative Adverse Outcomes. Anesthesiology 121: 695-706. doi: 10.1097/ALN.00000000401.

Shreve, J., Van Den Bos, J., Gray, T., Halford, M., Rustagi, K., & E.Ziemkiewicz. (2010). The economic measurements of medical errors. *Society of Actuaries.* Schaumberg., IL. Retrieved from: https://www.soa.org/research-reports/2010/research-econ-measurement/

Tan JA, Helsten D.(2013) Intraoperative handoffs. International Anesthesiology Clinic. 51:31–42 doi: 10.1097/AIA.0b013e31826f30ea

The Joint Commission (2007, November). Improving America's Hospitals: The Joint Commission's Annual Report on Quality and Safety 2007. Retrieved October 27, 2016, from http://www.jointcommission.org/assets/1/6/2007_annual_report.pdfhttp://www.jointcommission.org/assets/1/6/2007_annual_report.pdf

The Joint Commission (2012, June). Transitions in Care: The need for a more effective approach to continuing patient care. Retrieved October 27, 2016, from https://www.jointcommission.org/assets/1/18/Hot_Topics_Transitions_of_Care.pdf

Joint Commission (n.d.). Handoff communications targeted solutions tool. Joint Commission Center for Transforming Healthcare. Retrieved from: https://www.centerfortransforminghealthcare.org/-/media/Enterprise/CTH/Documents/What-We-Offer/HOC_TST_Implementation_Guide.pdf

Thomassen, Ø, Storesund, A., Søfteland, E., & Brattebø, G. (2013). The effects of safety checklists in medicine: A systematic review. *Acta Anaesthesiologica Scandinavica, 58*(1), 5-18. doi:10.1111/aas.12207

Titler, M. G., Kleiber, C., Steelman, V. J., Rakel, B. A., Budreau, G., Everett, L. Q., Buckwalter, K. C., Goode, C. J. (January 01, 2001). The Iowa Model of Evidence-Based Practice to Promote Quality Care. Critical Care Nursing Clinics of North America, 13, 497-510.

UK EQUATOR Centre. (n.d.). The EQUATOR Network. The Centre for Statistics in Medicine, University of Oxford. Retrieved January 29, 2017, from http://www.equator-network.org.

Wein, H., & Contie, C. (2011, April). Waking up to anesthesia. Learn more before you go under. NIH News in Health. Retrieved April 02, 2017, from https://newsinhealth.nih.gov/issue/apr2011/feature1

Wright, S. (2013). Examining Transfer of Care Processes in Nurse Anesthesia Practice: Introducing the PATIENT Protocol [Abstract]. *American Association of Nurse Anesthetists Journal, 81*(3). Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/23923675

Appendix A-Observer Audit Tool for Direct Observation

Critical elements of PATIENT

P: □ procedure, □ patient, □ pertinent history, □ position

A: □ anesthesia, □ antibiotic, □ airway, □ allergies

T: □ temperature

I: □ IV, □ other invasive devices

E: □ E-end tidal CO2 (ventilation)

N: □ narcotics

T: □ twitches

Total: _14/___

Appendix B-Self Audit Tool for Indirect Observation

Instructions for use: Thank you for using PATIENT during your handoff! Please review the critical elements of the PATIENT tool and check the block next to each element that you discussed during handoff. Please be honest when filling this form out, there is no penalty for failing to mention a critical element. To protect all participants privacy please DO NOT write your name on this form. Once completed, please deposit in the collecting box in the anesthesia medication room. Thank you for participating in this project!

Critical Elements of PATIENT

P: □ procedure, □ patient, □ pertinent history, □ position

A: □ anesthesia, □ antibiotic, □ airway, □ allergies

T: □ temperature

I: □ IV, □ other invasive devices

E: □ E-end tidal CO2 (ventilation)

N: □ narcotics

T: □ twitches

Total: _14/___

Appendix C Project Timeline

Project Timeline: FBCH Implementing Anesthesia Handoff Tool												
Project Year 1: 2018												
Activity	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**
USUHS VPR Approval (pending IRB approval)	X											
Site IRB Submission and Approval	X											
Project Implementation/Data Collection ● Phase I: Pre Intervention Observation	X											
Project Implementation/Data Collection ● Phase II: Education and Acclimation		X										
Project Implementation/Data Collection ● Phase III: Post Intervention Observation		X	X									
Data Analysis	X	X	X	X								
AANA Poster Submission												
AANA Poster Presentation								X	X			
Dissemination: PPT and Project Report ● Present to FBCH Leadership								X				

Project Year 2: 2019												
Activity	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**
Dissemination: PPT and Project Report ● Present to DNP Committee					X							
Research Week Poster Submission			X	X								
Research Week Poster/Project Presentation					X							

Appendix D: Literature Matrix

CPT DeBarros
CPT Wilhoit

References & Purpose			Sample & Design		Variables		Outcomes		Overall Quality		PICO Correlation
Authors, title, journal	Year pub	Purpose	Sample	Research Design	Independent	Dependent	Statistical Analysis/Results	Level of Evidence	Strengths	Weaknesses	How it relates to our PICO
Agarwala, A.V., Firth, P. G., Albrecht, M. A., Warren, L., & Musch, G. (2015). An Electronic Checklist Improves Transfer and Retention of Critical Information at Intraoperative Handoff of Care. Anesthesia and Analgesia, 120(1), 96-104. doi:10.1213/ane.0000000000000506	2015	improve anesthetic handoffs by creating an EMR checklist, surveys were done to evaluate the efficacy of the checklist	Conducted in a large Boston Medical Center, on end of shift handoffs over 3 month period, observed all anesthesia providers, on all surgeries	Observational study- anesthesia providers were observed giving handoff to measure accuracy and completeness of information before and after implementation of the handoff tool; Additionally authors regularly surveyed staff satisfaction with checklist allowed for feedback for improvements	use of checklist vs not using the checklist	frequency and accuracy of key elements relayed; perception of improved communication	Two tailed fisher exact test during the observation assessment for information transfer with the checklist and information recall during handoffs without the checklist. ....Also used for pre/post satisfaction surveys. Chi square test was used to compare categorical variables that were not dichotomous (CRNA vs faculty MDA), P values <0.05 considered significant; Compared to without the checklist transfer of information about meds, fluids, and communication increased significantly with the checklist: vasopressors 44% to 83%; ABX 63% to 97%, and antiemetics 15 to 46%; fluids 80 to 97%; Also showed improved communication between anesthesia and surgical team increased by 50%; Post surveys indicated a perceived improvement in quality of communication, and decrease in perception of being rushed- observations showed with the checklist only took 2 minutes longer;	Level III	-observation was objectified with an assessment tool; improvement in communication, and increased accuracy of "key end points/critical elements" such as vasopressors, ABX, antiemetics supports other literature findings that these influence postoperative outcomes.	-use of the checklist was voluntary, do not mention how many handoffs observed out of the total done (done at end of shift, on "available basis" - observation- Hawthorne effect; small sample size;	supports the use of checklist to improve accurate and completeness of information at time of transfer, and improved communication between anesthesia providers and surgical team- enhancing team dynamics, also gave insight on strategies for implementing and eliciting feedback from staff
Boat, A. C., & Spaeth, J. P. (2013a). Handoff checklists improve the reliability of patient handoffs in the operating room and postanesthesia care unit. Pediatr Anesth, 23(7), 647-654. doi:10.1111/pan.12199	2013	Quality improvement project to create intraoperative and PACU handoff checklist	3 week observation of intraoperative and postoperative handoffs across 28+ ORs and 32-bed PACU at Cincinnati Children's Hospital Medical Center (does not specify how many observations performed)	Quality improvement project, QI teams did a "smart aim" method- tools were developed, and revised based on feedback from staff using tools- "plan-do-act" cycles	using the handoff tool	reliable transfer of information	Reliability of handoffs increased from 20-100% with the tool, PACU was 56-90%	Level V	Educated staff, then tested it, and revised it based on results; Surveyed and revised tool at regular intervals	Did it impact work flow? Is unknown. not every staff member was required to respond to the surveys-was dependent upon buy-in from senior levels, bias to the components of the handoff checklist- did it truly contain all the "essential components", study lacks detailed results analysis, not explicit in how they got from 20-100%	They used a handoff tool and direct observed handoffs, measured improved "reliability" in communication. Used input from staff to revise tool, increasing usability, and buy-in from staff; Provides a model for quality improvement project framework
Wright, S. M. (2013). Examining transfer of care processes in nurse anesthesia practice: introducing the PATIENT protocol. AANA journal, 81(3), 225.	2013	(1) To examine current transfer of care practices of CRNAs during the intraoperative period and (2) develop, implement, and evaluate a communication checklist tool designed to improve situation awareness.	Convenience sample sent to 1000 CRNAs througout the US. Surveyed were CRNAS that are active members of Virginia Assoc. of Nurse Anesthetists in Richmond & CRNAs around the country that attended regional CE conferences offered in past 5 years by Nurse Anesthesiology Faculty Associates of VCU	2-phase non-experimental exploratory study; descriptive cross-sectional survey	use of checklist tool	situational awareness	descriptive statistics used to analyze 30% survey response rate: Phase I -72% indicated no current process in place for handoff -factors most important to communication identified as: PMSH, allergies, level of difficulty ventilation/intubation -factors least important to communicate ID'd as: antiemetic administration and temperature -part of the transfer process would lead them to adopt tool: patient safety (77%) Phase II: PATIENT tool developed based on Phase I and evaluation of the tool through electronic administration of 10 item survey with 40% response rate -90% responded agreed with use of tool, length of scope and tool were appropriate, and that the tool lent itself to memory	Level V	-Good insight into the development of a tool using current providers' opinions for real world application. -Positive buy-in from those that used the tool; they thought it was easy to use and effective	No observational studies or outcomes reported for identification in changes in communication or patient outcomes. Limited discussion of weaknesses and study limitations, just launches straight into discussing use of checklists in creating high reliability organizations, ex: airline industry	Intraoperative tool development and implementation between anesthesia providers; results loosely related to patient safety outcomes via provider opinions; Provides critical elements and framework for "ideal" universal handoff tool
Apator and Gillein (2016) - The Effectiveness of An Anesthesia Handoff Tool: An Electronic Health Record Application to Enhance Patient Safety - Anesthesia eJournal	2016	-formalize anesthesia TOF process by developing an electronic anesthesia handoff tool to decrease errors/omissions during exchange of information, enhancing pt safety - compare the incidence of patient	-Study site at Sentara Careplex Hospital Hampton VA; -10 part time and full time CRNAs (only CRNAs) b/t 25-70 y/o -demographics: 3 male, 7	-preintervention and postintervention observational design -**Preintervention:** observed 82 anesthesia TOC prior to introducing electronic handoff tool- observing routine practice habits, recording omissions/inaccuracies on a 13	the electronic handoff tool, time of day, ASA status	number of omissions/inaccuracies	**ANAYLSIS** omissions graded ordinally; 1= partial omission 2 = full within each of 12 essential components of HO tool -independent two tailed t tests to compare omissions/inaccuracies pre/post tool implementation -used independent two tailed t test with Levene's test for equality of variances	III-	-first study to observe perioperative handoff process of CRNAs -pre observation gathered baseline data for routine habits- supported the wide variance in practice - considered other potential variables	-does not explain the rationale behind the fixed number of pre/post observations? what drove that decision? -only CRNAs included, did not include MDAs -tool education was through a third party-	-measures the quality of the H/O through number of omissions/inaccuracies vs quality of communication -ID's gap in literature in how do electronic H/O affect morbidity and mortality, further supports that communication failures threaten patient safety due
Articles published after project implemented											
Canale, M. "Implementation of a standardized handoff of anesthetized patients." AANA Journal, 86, 2, 137-145.	2018	-implement a standardized handoff for anesthesia providers to improve the quality and continuity of the transfer of information, perceptions of patient safety, and healthcare worker satisfaction.	-20 CRNAs -800 bed regional medical center	-CRNAs were randomly selected to create an "intervention-change team" -participant underwent education and training on perioperative communication using the TeamSTEPPs model, current guidelines and evidence based literature on anesthesia specific handoff tools. -The group chose to implement a modified PATIENT tool and utilized it over a 2 week period - The group completed pre and post intervention likert surveys assessing use of the tool during handoff, satisfaction, and relation perception of patient safety,	-use of the tool vs not using the tool	- perception of improved quality and continuity of communication, patient safety and CRNA satisfaction	-descriptive analysis was used for anaylzing survery results	IV	-Used a validated and organized framework for creating a change team and guiding training and education; -Mitigated bias of team by specifically including a mixture of early adopters, laggards, and nay-sayers	-lack of full inclusion and sustainment: only 20 anesthesia providers out of the whole were included in this project- only these team members received the full training and education on impact of standardized perioperative communication	- Modified the PATIENT tool -A creative implementation strategy using TeamSTEPPs was a comprehensive method that lended itself to success within the department -Adds to body of literature for varied implementation strategies
Agarwala, A & Lane-Fall, M. "The evidence base for the optimal conduct of handoffs". Anesthesia Patient Safety Foundation Newsletter. Vol 32, No. 2	2017	-Literature review describing relationship between perioperative handoffs and patient outcomes, and exploring evidence between best perioperative handoff practices	Literature review including studies examining all perioperative environments: ICU to OR, anesthesia to anesthesia provider, and OR to ICU/PACU	n/a	n/a	n/a	- There is adequate literature showing the relationship between increased transitions in care and increased risk for adverse patient outcomes. - There is a lack of high powered studies examining the optimal handoff mechanism/tool and implementation strategy	III	-Provides an organized snapshot of the current literature for this topic	n/a	-Summarizes the most recent literature specific to perioperative handoffs. -Provides the anesthesia community with future directions for research: a head to head anesthetic handoff tool comparison; and implementation strategy comparison
Gitney, C., Lee, Y.-M., Aquino, K., & Frolko, J. Needs assessment for development of the TIME anesthesia handoff tool. AANA Journal, 85, 6, 431-437.	2017	-to assess the need for a standardized anesthesia handoff tool and identify the most essential components for a handoff tool.	- convenience sample of anesthesia providers (CRNAs, SRNAs, anesthesia residents, and anesthesiologist) at 2 large, academic institutions spanning 4 hospitals	-descriptive study via survey -inclusion criteria: currently practicing anesthesia provider with >6 months experience -questions designed on a likert scale to discern perceived need for handoff tool and the most essential components to build ideal tool - developed mnemonic TIME handoff tool	n/a	n/a	Quality improvement project; QI teams did a "smart aim" method- tools were developed, and revised based on feedback from staff using tools- "plan-do-act" cycles	III	-study design utilized a pre-existing, validated form of standardized communication study framework (air traffic controller) -varied survey population and respondants -Adds to body of literature, second anesthesia specific mnemonic tool to compare against the PATIENT protocol	-lacks an implementation arm to test the feasibility and practicality of the TIME tool -questions were limiting (did not specify type of medications opioids/antiemetics, etc)- free texting was an option -inherent survey limitations: self reporting (performance could be worse) and convience sample	-interesting handoff technique: provides a different perspetive for how to conduct report by first having oncoming do an "observation" to build situational awareness before engaging in the offgoing provider -Provides insight into other critical components for building a anesthesia specific tool -Although lacks an implementation strategy, it adds to body of literature for future head-to-head comparisions of tools

Appendix D: CITI Certificate

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 1 OF 2
COURSEWORK REQUIREMENTS*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- Name: Shayna De Barros (ID: 5741957)
- Email: shayna.debarros@usuhs.edu
- Institution Affiliation: Office of the Under Secretary of Defense (Personnel and Readiness) (ID: 603)
- Phone: 301-295-4700

- Curriculum Group: OUSD P&R Human Research
- Course Learner Group: Biomedical Investigators and Research Study Team
- Stage: Stage 1 - Biomedical Investigators

- Report ID: 20622038
- Completion Date: 28-Aug-2016
- Expiration Date: 28-Aug-2019
- Minimum Passing: 80
- Reported Score*: 96

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED	SCORE
Avoiding Group Harms - U.S. Research Perspectives (ID: 14080)	27-Aug-2016	3/3 (100%)
Recognizing and Reporting Unanticipated Problems Involving Risks to Subjects or Others in Biomedical Research (ID: 14777)	27-Aug-2016	5/5 (100%)
Populations in Research Requiring Additional Considerations and/or Protections (ID: 16680)	27-Aug-2016	5/5 (100%)
Module for Non-DoD Personnel Conducting Research Involving Human Subjects Supported by the DoD (ID: 16769)	27-Aug-2016	No Quiz
History and Ethics of Human Subjects Research (ID: 498)	27-Aug-2016	7/7 (100%)
Basic Institutional Review Board (IRB) Regulations and Review Process (ID: 2)	27-Aug-2016	5/5 (100%)
Informed Consent (ID: 3)	27-Aug-2016	5/5 (100%)
Social and Behavioral Research (SBR) for Biomedical Researchers (ID: 4)	27-Aug-2016	4/4 (100%)
Records-Based Research (ID: 5)	27-Aug-2016	3/3 (100%)
Genetic Research in Human Populations (ID: 6)	28-Aug-2016	5/5 (100%)
Vulnerable Subjects - Research Involving Children (ID: 9)	28-Aug-2016	3/3 (100%)
Vulnerable Subjects - Research Involving Pregnant Women, Human Fetuses, and Neonates (ID: 10)	28-Aug-2016	3/3 (100%)
FDA-Regulated Research (ID: 12)	28-Aug-2016	5/5 (100%)
Conflicts of Interest in Research Involving Human Subjects (ID: 488)	28-Aug-2016	5/5 (100%)
Office of the Under Secretary of Defense (Personnel and Readiness) (ID: 912)	28-Aug-2016	No Quiz
Stem Cell Research Oversight (Part I) (ID: 13882)	28-Aug-2016	4/5 (80%)

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

Verify at: https://www.citiprogram.org/verify/?4e8c1193-e1a3-4cdd-a3c3-1ae355757162

CITI Program
Email: support@citiprogram.org
Phone: 888-529-5929
Web: https://www.citiprogram.org

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 1 OF 2
COURSEWORK REQUIREMENTS*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Angela Wilhoit (ID: 5751364)
- **Email:** angela.wilhoit@usuhs.edu
- **Institution Affiliation:** Office of the Under Secretary of Defense (Personnel and Readiness) (ID: 603)
- **Institution Unit:** USArmy
- **Phone:** 3012959561

- **Curriculum Group:** OUSD P&R Human Research
- **Course Learner Group:** Biomedical Investigators and Research Study Team
- **Stage:** Stage 1 - Biomedical Investigators

- **Report ID:** 20649099
- **Completion Date:** 29-Aug-2016
- **Expiration Date:** 29-Aug-2019
- **Minimum Passing:** 80
- **Reported Score*:** 84

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED	SCORE
Avoiding Group Harms - U.S. Research Perspectives (ID: 14080)	29-Aug-2016	3/3 (100%)
Recognizing and Reporting Unanticipated Problems Involving Risks to Subjects or Others in Biomedical Research (ID: 14777)	29-Aug-2016	5/5 (100%)
Populations in Research Requiring Additional Considerations and/or Protections (ID: 16680)	29-Aug-2016	3/5 (60%)
Module for Non-DoD Personnel Conducting Research Involving Human Subjects Supported by the DoD (ID: 16769)	29-Aug-2016	No Quiz
History and Ethics of Human Subjects Research (ID: 498)	29-Aug-2016	6/7 (86%)
Basic Institutional Review Board (IRB) Regulations and Review Process (ID: 2)	29-Aug-2016	4/5 (80%)
Informed Consent (ID: 3)	29-Aug-2016	4/5 (80%)
Social and Behavioral Research (SBR) for Biomedical Researchers (ID: 4)	29-Aug-2016	4/4 (100%)
Records-Based Research (ID: 5)	29-Aug-2016	3/3 (100%)
Genetic Research in Human Populations (ID: 6)	29-Aug-2016	4/5 (80%)
Vulnerable Subjects - Research Involving Children (ID: 9)	29-Aug-2016	3/3 (100%)
Vulnerable Subjects - Research Involving Pregnant Women, Human Fetuses, and Neonates (ID: 10)	29-Aug-2016	3/3 (100%)
FDA-Regulated Research (ID: 12)	29-Aug-2016	5/5 (100%)
Conflicts of Interest in Research Involving Human Subjects (ID: 488)	29-Aug-2016	4/5 (80%)
Office of the Under Secretary of Defense (Personnel and Readiness) (ID: 912)	29-Aug-2016	No Quiz
The Federal Regulations - SBE (ID: 502)	29-Aug-2016	2/5 (40%)

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

Verify at: https://www.citiprogram.org/verify/?29c5e7e8-8922-476d-8053-fc542cfed7f2

CITI Program
Email: support@citiprogram.org
Phone: 888-529-5929
Web: https://www.citiprogram.org

Appendix E: NOPA

USU
Uniformed Services University

OFFICE OF RESEARCH
4301 JONES BRIDGE ROAD
BETHESDA, MAYLAND 20814
PHONE: (301) 295-3303; FAX: (301) 295-6771

NOTICE OF PROJECT APPROVAL

Change Number: Original

VPR Site Number:	GSN-61-10261
Principal Investigator:	Wilhoit, A. Noel
Department:	Graduate School of Nursing
Project Type:	Student
Project Title:	Implementional of an Intraoperative Handoff Tool for Anesthesia Providers
Project Period:	12/12/2018 to 5/1/2019

Assurance and Progress Report Information:

Name	Sup	Approval Type	Status	Approved On	Forms Received
Progress Report	0		Final	To be Submitted	N/A

Remarks:
This Notice of Project Approval has been reviewed and approved. Please remember that you must submit a final Progress Report (Form 3210) upon completion of this project.

Questions regarding this approval should be directed to the following person in the Office of Research: Sharon McIver, (301) 295-9814.

[redacted] 6 Dec 2018

Yvonne T. Maddox, Ph.D. Date
Vice President for Research
Uniformed Services University of the Health Sciences

cc: Wilhoit, A. Noel
File

Appendix F: IRB Exemption

DEFENSE HEALTH AGENCY
FORT BELVOIR COMMUNITY HOSPITAL
9300 DEWITT LOOP
FORT BELVOIR, VIRGINIA 22060-5901

FBCH-RPCI 20 December 2017

FROM: Fort Belvoir Community Hospital (FBCH) Department of Research Programs (DRP) Determinations

TO: CPT Shayna DeBarros, AN, USA, RN, BSN, CCRN

SUBJECT: FBCH DRP Determinations Review of Project #900034; Reference #896791

PROJECT TITLE: Implementation of a Standardized Intraoperative Hand-Off Tool for Anesthesia Providers

SUBMISSION TYPE: New Project

ACTION: Determination of Not Research—Evidence Based Practice (EBP)

DECISION DATE: 20 December 2017

1. Thank you for your submission of the plan and supporting materials for this project. A FBCH DRP Determinations Official has determined the activity as described is an EBP Project and does not meet the full definition of research as defined in 32 Code of Federal Regulations 219.102(d). Submission of an IRB research application is not required.

2. This project is an Anesthesia initiative to implement and evaluate the use of a standardized handoff tool for anesthesia providers within the intraoperative environment of this organization (FBCH).

3. Your Departmental support is noted.

4. Any changes to your project must be reviewed by a FBCH DRP Determinations Official to ensure that the changes do not impact this Determination.

5. Any publication(s) or manuscripts arising from this work must be submitted and cleared through the publication clearance process. Many journals are interested in publishing EBP projects. If you do decide to publish your EBP findings, please use paragraph headings such as "issue", "procedures for collecting and evaluating information", "information found", "lessons learned", etc. and avoid using terminology such as "research questions", "methods", "results", "study limitations", etc.

Appendix G: PAO Clearance

REQUEST FOR PUBLIC RELEASE

(This form is to be used at Fort Belvoir Community Hospital in requesting review and clearance of DoD information for public release in accordance with DoDD 5230.09)

1. DOCUMENT DESCRIPTION

a. TYPE	b. TITLE	
DNP project final report	Implementation of a Standardized Intraoperative Handoff Tool for Anesthesia	
c. DATE OF SUBMISSION: 20190412	d. PAGE COUNT: 43	e. RESEARCH OR PUBLIC CLEARANCE?: IRB exempt
f. CLEARANCE REQUESTED BY *(YYYYMMDD) (All submissions require a minimum of 10 days for review)*: 20190506		

2. AUTHOR/SPEAKER *(If more than one author, include names of additional authors on separate sheet.)*

a. NAME *(Last, First, Middle Initial)*	b. AFFILIATION *(Armed service, civilian, contractor)*	c. RANK
DeBarros, Shayna	US Army	MAJ
d. DEPARTMENT/CLINIC: Anesthesia		

3. PRESENTATION/PUBLICATION DATA *(Date, Place, Event)*

May 14, 2019
Uniform Services University Research Week
Bethesda MD

4. POINT OF CONTACT

a. NAME *(Last, First, Middle Initial)*	b. EMAIL	c. TELEPHONE NO.
DeBarros, Shayna	shayna.debarros@usuhs.edu	954-294-9977

5. STAFF JUDGE ADVOCATE (SJA) COORDINATION

a. NAME *(Last, First, Middle Initial)*:

b. REMARKS

Should not display or publish various individuals' written/signed signatures;

Accept/incorporate tool brand name ("PATIENT") deletions made in manuscript - other than to identify it as the tool used in project (approx. mentioned not more than 3 times throughout manuscript).

c. SUBMISSION IS: ○ APPROVED ◉ APPROVED WITH QUALIFICATIONS *(See REMARKS, block 5b)* ○ NOT APPROVED

d. SIGNATURE: [redacted] e. DATE SIGNED *(YYYYMMDD)*:

6. PUBLIC AFFAIRS OFFICER (PAO) COORDINATION

a. NAME *(Last, First, Middle Initial)*: Lombardi, Autumn M.

b. REMARKS

none

c. SUBMISSION IS: ◉ APPROVED ○ APPROVED WITH QUALIFICATIONS *(See REMARKS, block 6b)* ○ NOT APPROVED

d. SIGNATURE: [redacted] e. DATE SIGNED *(YYYYMMDD)*: 20190501

Submitted documents require both Staff Judge Advocate (SJA) and Public Affairs Officer (PAO) approval in blocks 5c and 6c above before public release. Please note any qualifications for approval, which will be included in the REMARKS block (if applicable). If approved by both SJA and PAO, the material is approved for public release and clearance for open publication is recommended under the provisions of DoDD 5230.09

FBCH STRATCOM FORM 1910, OCT 2015

Appendix H: DNP Project Completion Form

Appendix G: Daniel K. Inouye Graduate School of Nursing
DNP Project Completion Verification Form

DOCTOR OF NURSING PRACTICE PROJECT
Completion Verification Form

The DNP Project titled:

"Implementation of a Standardized Intraoperative Handoff Tool for Anesthesia Providers"

was completed at Fort Belvoir Community Hospital, by the following student(s):

(type student name)	*(signature)*	*(date)*
Shayna DeBarros	[redacted]	15APR2019

The DNP Practice Project Team verifies that the following components of the DNP project, accomplished by the above students, is of sufficient rigor and demonstrates doctoral level scholarship to meet the requirements for USUHS GSN graduation:

- Presentation of DNP project to the leadership/stakeholders at the Phase II Site,
- Abstract/Impact Statement (*Appendix F*), and
- DNP Project written report.

Verified by:

(type name)	*(signature)*	*(date)*	
Sandra Bruner	[redacted]	29 Apr 2019	Senior Mentor
for LTC Thom Sellers		29 Apr 2019	Team Mentor & Phase II Site Director

For RNA Students only *- add the following additional signature for final verification of project completion:*

CDR Kennett Radford RNA Project Director	[redacted] *(Signature)*	4/30/2019 *(Date)*

Form Version: 26 Aug 2017