Improving Handoffs from the Operating Room to the Post Anesthesia Care Unit

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Table of Content

Abstract

Site Location: Fort Belvoir Community Hospital, VA (FBCH)

Title: Improving Handoff from the Operating Room to the Post Anesthesia Care Unit

Authors: Aguirre, F, Drebenstedt, R, Henderson, E, & Sokolowski, A.

Background/Problem: The Joint Commission listed communication failure as the number one cause of anesthesia related sentinel events. At Fort Belvoir Community Hospital, there was concern for potential medication errors due to inconsistent methods of patient handoff communication between anesthesia staff and PACU nursing staff.

Clinical Question/Purpose: Among anesthesia providers and PACU Registered Nurses at FBCH, how does a standardized handoff tool compare to the current SBAR handoff methods improve communication of administered intraoperative medications?

Project Design: This was a quality improvement project that implemented the use of a standardized handoff tool between anesthesia providers and PACU nursing staff. The project evaluated 45 handoffs of care between anesthesia providers and PACU RNs pre-intervention compared to 39 handoffs post-intervention. Anesthesia providers and PACU RNs received evidence-based training regarding the importance of using the standardized tool during handoff.

Analysis of the Results: There was a statistically significant decrease ($p<0.0001$) in patient handoffs that utilized no communication tool with a pre-intervention number of 12 reports and a post-intervention of only 6 reports. A similar decline ($p<0.0001$) in use of the informal tool was observed with a pre-intervention incidence of 33 and a post-intervention incidence of 13. There

was a notable increase ($p<0.0001$) in utilization of the standardized handoff tool with a pre-intervention incidence of 0 and a post-intervention incidence of 20.

Organizational Impact/Implications for Practice: Although this quality improvement project showed statistical significance, clinical significance of these results merit further analysis. The available literature showed a positive impact to institutional function and patient safety through standardized communication between departments.

Introduction

The potential for real patient harm exists with communication failures between health care providers. The Joint Commission listed communication failure as the number one cause of anesthesia related sentinel events (Park et al., 2017). Fort Belvoir Community Hospital (FBCH) was experiencing ineffective communication during handoff immediately after surgery between anesthesia providers and Post Anesthesia Care Unit (PACU) Registered Nurses (RN). The communication breakdown had led to errors involving dosing frequency of analgesic medications. Prior to implementation of this project, FBCH did not have a standardized method of communication between anesthesia providers and PACU RNs. Implementation of a standardized method of communication between the anesthesia providers and the PACU RNs with focus placed on pertinent information, is a practical and definitive solution.

Problem Synthesis

At Fort Belvoir Community Hospital, there was concern for potential medication errors due to inconsistent methods of patient handoff between anesthesia providers and PACU RNs. After a review of six months, (April-October 2021) of historical data from the patient safety department, two incidents of medication errors occurred in the PACU environment. According to the Advancing Managed Pharmacy Care (AMPC), the average extra medical cost for treating medication errors in hospitals alone is roughly $2,000 per error with an additional $51,000 average cost owing to patient morbidity and mortality (AMCP, 2019). Extrapolating this data projects a total cost for four incidences per annum as $212,000. Additional benefit and cost analysis can be found in the business case analysis in Appendix A.

Evaluation of the local process at FBCH revealed fragmentation of communication. In the operating room the anesthesia providers documented all medication administration within the

Innovian platform; while RNs in the PACU solely utilized the Essentris platform for medication documentation. Two processes were in place at FBCH to overcome inter-platform communication weakness. The most widely utilized process was a verbal handoff report from the anesthesia provider to the PACU nurse. The second was for the PACU nurse to evaluate the Innovian PDF report uploaded into Essentris as a note, for additional information. Both processes had weaknesses. A verbal report has potential for errors and unintended omissions of intraoperative procedures. The translation method placed an additional burden of time and charting onto the PACU nurse. An ideal solution overcomes both the system and process limitations. Through the implementation of a standardized tool to improve handoff from the anesthesia provider to the PACU nurse, essential items of care can reliably be addressed.

Relevance to Military Nursing

The Army's role in the Multi-Domain approach assists the Combatant Commander with four strategic goals: Shape Operational Environment, Prevent Conflict, Conduct Large-Scale Ground Combat Operations, and Consolidate Gains. The impact of a flawed Military Health System on the Combatant Commander decreases the number of service members available to conduct operations and limits the number of wounded warfighters that return to the fight. These limitations impact mission readiness, combat power, and total force projection.

Solving these communication limitations will allow FBCH to achieve goals nested within those of the Department of Health Agency (DHA) and Military Health System (MHS). The DHA has set forth four areas for improvement as described in the Quadruple Aim Value Model: readiness, population health, the experience of care, and per capita costs. As discussed in the previous section in greater detail, solving the communication limitations improves patient safety. Improved patient safety directly aligns with enhancing the experience of care, one of the quadruple aim model tenets (Health.mil. 2013). Preventing patient harm leads to reduced per capita costs and improves readiness. These improvements will allow FBCH to better align with the broader mission directive of the DHA and MHS.

Clinical Question

Among anesthesia providers and PACU Registered Nurses at FBCH, how does a standardized handoff tool compare to the current SBAR handoff methods improve communication of administered intraoperative medications?

Literature Review of Solutions

We conducted a literature review utilizing the following PICO question: “Among anesthesia providers and PACU RNS at FBCH, how does a standardized handoff tool compare to the current SBAR handoff methods to improve communication of administered intraoperative medications?” We conducted searches within the CINAHL, PubMed, and Ovid databases utilizing the following Boolean operators: (anesthesia AND handoff) AND (post-anesthesia), (anesthesiologist OR certified registered nurse anesthetists), (anesthesia AND handoff AND errors), (anesthesia AND pacu OR post-anesthesia OR postoperative AND handoff). All articles were limited to being published between 2011 through 2021.

The search criteria revealed a total of 41 studies that required additional screening. The 41 studies were uploaded into Covidence, a systematic review management software. Covidence removed 15 studies as duplicates, leaving 26 studies. Examination of the abstracts revealed 17 studies were not relevant. The remaining eight studies were evaluated via full text for appropriateness using the inclusion criteria, specificity for the PACU environment. Two studies were excluded that focused on areas outside the PACU environment. We extracted vital information from the remaining six studies.

A PRISMA Flow Chart was created as a visual representation of our literature review (Appendix B). Utilizing the John Hopkins Nursing Evidence-based Practice Rating Tool, we categorized the six studies based on the level and quality of evidence. There were one IA, IB, IIB, and VA studies and two IIIB studies (Appendix C).

Solution Synthesis

Concerns for pertinent information during patient handoff vary between the anesthesia provider and PACU RNs. An investigative evaluation of stakeholders during handoff, to include nurse anesthetists, anesthesiologists and PACU RNs, revealed the primary emerging categories of concern were differing temporal foci during handoff, insecurities of when information is transferred from one team to another, and information overload (Randmaa et al., 2017). Randmaa et al. (2017) concluded the use of memory aids or structure through written information enhanced data transfer and cooperation between the perioperative team members. Anesthesia providers often focus on events that occurred during the operation time window, while PACU RNs focus on the patient's needs post-operatively (Randmaa et al., 2017).

Segall et al. (2012), further supported the findings. A lack of structure in communication or the failure to use digital/printed post-operative reports resulted in striking consistencies of incomplete information, poor organization, and information overload during handoff. Beyond communication improvement, Segal et al. (2012) indicated a reduction in morbidity and mortality through the coupling of team training and a handoff tool.

Pucher et al. (2015) analyzed numerous studies in order to prove the benefit of tool utilization. Of the 19 studies reviewed, 16 revealed positive improvements in handoff processes, more completeness of information, and reduction in error rate. The results found by Pucher et al. (2015) were obtained using a variety of handoff tools. Collectively, the outcomes favored the utilization of a tool or checklist during handoff between an anesthesia provider and PACU RNs.

A more recent study by Park et al. (2017) confirmed a statistically significant improvement in handoff quality through pre and post intervention observation after implementation of a standardized communication tool. Although Park et al. (2017) described an increase in handover time by one minute when a standardized handover tool was utilized, the benefit of greater data transfer and fewer pertinent omissions made it worthwhile.

Utilizing a standardized handoff tool during the critical transition from surgery to the PACU is a common thread in reducing the number of omitted essential handoff items. Having sufficient data to satisfy the advantage of utilizing a communication tool during handoffs, we narrowed our focus to selection of a standardized tool that could appropriately be integrated into FBCH. The tool needed to address the needs of both anesthesia providers and PACU RNs to achieve the most significant buy-in. Halterman et al. (2016), demonstrated a concise tool relayed clear information while mitigating information overload and omission of critical items. Lambert and Adams (2018) supported the utility of the Written Handoff Anesthesia Tool (WHAT) by demonstrating an 80% reduction in incomplete information during handoff. We concluded a printed standardized tool is the superior option for improving postoperative handoffs at FBCH to reduce omitted data and the burden on PACU RNs while maximizing efficiency.

Focus Area

We sought involvement from pertinent stakeholders in PACU and anesthesia departments to implement this project. This included anesthesia leadership, anesthesia providers active in clinical practice, PACU leadership, and PACU RNs. The primary aim of this evidence-based project was to standardize the handoff between anesthesia providers and PACU RNs. To achieve this goal we needed to improve the quality of communication during patient handoff with the use of a standardized tool tailored to the needs of FBCH. Our terminal goal was to reduce the occurrence of medication errors occurring in the PACU as a result of ineffective communication between anesthesia providers and PACU RNs.

Organizing Framework

We selected the Iowa Model for Research-Based Practice to Promote Quality Care because it is a team oriented model allowing for the inclusion of anesthesia providers and PACU RNs. Additionally, the Iowa Model is driven by problem focused triggers, which led us to evaluate the potential for adverse medication events in the PACU and how to mitigate the likelihood of such events from occurring (Appendix D). This project was identified as a priority by the directorate at FBCH, and there was strong support from key stakeholders in leadership from the anesthesia and PACU departments. In the following section we discuss our design plan to create a handoff tool for anesthesia staff and PACU RNs.

Project Design

General Approach

This project was an evidence-based practice improvement project utilizing a literature review in order to implement best practices. A pre and post-intervention analysis of data was performed to assess staff utilization of a standardized handoff tool. Findings were then disseminated as the final step of the project.

Setting and Population

The setting for this evidence-based project was Fort Belvoir Community Hospital, a Department of Defense medical treatment facility located in Northern Virginia with approximately 120 beds and over 8,000 surgeries annually. The population was all anesthesia providers (anesthesiologists and certified registered nurse anesthetists) and Phase 1 PACU nursing staff. Anesthesia providers and Phase 1 PACU nursing staff were comprised of Army, Navy, Government Service (GS) and contract employees.

Procedural Steps

In our aim to improve transitions from the operating room to the PACU we conducted this evidence- based project in four distinct phases. In phase I, we completed a literature review and synthesis of the literature. Additionally, we applied for and obtained electronic Institutional Review Board (eIRB) approval. Starting on or about January 2nd 2022, we began phase II of our project. In phase II, we gathered pre-intervention data from 12 anesthesia providers, evaluated their use of a verbal or written handoff tool during handoffs to the PACU, and conducted a data analysis. This occurred over the period of greater than 1 month and consisted of 45 handoffs of care. Each anesthesia practitioner was observed no more than 5 times during this period.

We implemented our intervention at the start of Phase III. The intervention provided in-person education to anesthesia providers and PACU RNs in the form of a visual presentation on the importance of standardized tool utilization and the formalized tool (Appendix E) to be used, developed by leadership in response to Defense Health Agency-Procedural Instruction (DHA-PI) Number 6025.45. The presentation captured more than 80% of anesthesia staff and 95% of

PACU staff. Phase III lasted approximately four months allowing for modifications of the proposed communication tool and education to the clinicians previously mentioned.

Phase IV included observation of 39 handoffs of care between 13 anesthesia staff and PACU RNs to determine tool selection and utilization. This period lasted two months and each anesthesia provider was observed no more than 5 times during the post-implementation period. Phase V included data analysis and dissemination of results.

Data Analysis Plan

After coordinating with the Department of Research Programs, we determined we would be unable to prove statistical and clinical significance utilizing pre and post medication error rates due to the small number of medication errors.

The pre and post observations were analyzed by our statistician. Observations were stored as a nominal format to include frequency of communication methods utilized. Nominal data sets were provided to the Department of Research Programs for statistical analysis. Statistical analysis of the nominal frequency data was conducted via a Chi Square analysis performed using STATA version 15 (StataCorp, College Station, TX).

Potential Barriers

The potential barriers for this project included resistance to change, low compliance utilization of the tool, and a lack of understanding regarding the importance of a standardized communication tool during handoffs. However, with the orchestration of an adequate education plan we were able to increase awareness and key stakeholder buy-in.

Dissemination Plan

The findings from this project were presented to the anesthesia department and recovery room staff. Dissemination of information included a poster presentation at the Uniformed Services University Research Symposium and virtual teleconference with Uniformed Services University Graduate School of Nursing faculty. Additionally, this DNP project report will be stored in the university archives for the Uniformed University of the Health Sciences which is available to the general public.

HIPAA Concerns and Considerations

No patient data was collected during the implementation of our project. While providers and PACU staff were observed directly, the provider's privacy was protected. Provider's names were kept in a separate spreadsheet that was not reported in our final data. We tracked which providers we observed to ensure adequate sample variation and size of our observations. For example, provider John Doe was known in our data collection table as Provider 1. Additionally, provider information was protected by eliminating their names from our data tables. The separate spreadsheet was secured on common access card (CAC) enabled, and personal identification number enabled computers within a badge enabled locked room that only project team members had access.

Project Results

The Department of Research Programs statistician at FBCH completed statistical analysis using SAS software, Version of the SAS System for Windows. The statistician cross-tabulated pre-intervention (n=45) versus post-intervention (n=39) against the blinded outcome variables of interest which were defined as (Option A: no formal tool utilized), (Option B: informal tool utilized), and (Option C: formal tool utilized). The statistician utilized Pearson's Chi-square testing in addition to pairwise comparisons.

Results showed a statistically significant decrease in patient handoffs that utilized no communication tool with a pre-intervention number of 12 reports and a post-intervention incident of 6 ($p<0.001$). A similar decline in use of the informal tool was observed with a pre-intervention incidence of 33 and a post-intervention number of 13 ($p<0.0001$). Lastly, a significant increase in utilization of the formalized communication tool was observed with a pre-intervention incidence of 0 and climbing to 20 post-intervention, respectively ($p<0.0001$). (Appendix F).

Analysis of the Results

This quality improvement project achieved a significant improvement in tool utilization and a marked decrease in handoffs being performed without a standardized communication tool. While the results showed statistical significance, clinical significance as a component of these results merits further analysis. Results were less clear regarding the goal of improved patient safety and reduced medication errors through standardization of communication. The low number of medication errors within the six month period prior to intervention would fail to provide significance even with the post-intervention medication error rate of zero. Though we achieved statistical significance, we were hesitant to state clinical improvement in patient safety or standardization of communication.

Organizational Impact / Implications to Practice & Policy

This quality improvement project did not provide clinically significant differences based on conclusions drawn from the results of this project alone, we could not attest to new impact or implications. However, pulled from the research we synthesized during the process of designing this project, we did attest the importance of standardized communication between departments, be that through a contiguous electronic medical record or a standardized written/verbal communication tool.

Future Directions for Research and Practice

Future directions of improving patient safety through standardization of communication remained unclear as a state of flux existed within the military medical complex. A growing number of Military Treatment Facilities (MTFs) have come under the control of DHA's policy and leadership. DHA will need to evaluate the utility and efficacy of their policies and communication tools at the treatment center level and allow for further refinement to achieve optimal results.

Additionally, the electronic health record utilized at FBCH also transitioned from Essentris and Innovian to MHS Genesis by Cerner. This transition eliminated one of the root causes we found to contribute to lost critical information during transitions between departments. The retrieval of critical data from Innovian reports logged in Essentris was difficult and time consuming in a fast paced, dynamic perioperative environment. MHS Genesis allowed for contiguous and easily accessible information in real time during a patient's perioperative encounter.

The utility of this quality improvement project to further advise on future direction was limited. New quality improvement projects and new metrics of measuring outcomes will need to be planned and evaluated once the DHA and MHS Genesis transitions have been accomplished within a respective MTF. There will likely be new dynamics, weakness, and patient safety concerns that will be difficult to predict at the time of this project.

Conclusion

This quality improvement project reviewed available literature to search for interventions that could be implemented to improve transitions of care from the OR to the PACU at FBCH. We utilized the Iowa Model of Evidence-Based Practice to guide our literature search and implemented our practice intervention. A standardized communication tool was selected to be utilized in the PACU. Since the literature showed formal communication minimized the potential for missed critical information in the postoperative period, we chose to assess our intervention in Phase 1 PACU, where analgesics are often administered following surgical procedures. Thirty-nine patient handoffs were evaluated following intervention and were compared against 45 observations preceding formal intervention. Ultimately, an increase in compliance utilizing a standardized tool was observed and found to be statistically significant. However, this improvement in communication could not be correlated to clinical significance.

We recommend each MTF to evaluate communication and work flow handoff throughout the perioperative period. Furthermore, continuous evaluation of the perioperative procedures, policy and documentation is critical to patient safety, due to the evolving environment found within an MTF.

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Appendices

Appendix A: Business Case Analysis

BUSINESS CASE with VALUE BASED CARE ASSESSMENT

Proposed Title for Project/Initiative/Opportunity to Improve

Improving Transitions from the Operating Room to the Post Anesthesia Care Unit

Opportunity Statement

At Fort Belvoir Community Hospital, there is concern for potential medication errors due to inconsistent methods of patient hand off communication between anesthesia staff and PACU nurses. Through the implementation of a standardized written handoff tool, essential items of care can reliably be addressed.

Business Opportunity/Objectives

1- Improved patient safety through standardization of items and methods of communication.
2- Increased efficiency of patient hand off resulting in decreased time spent during handoff.
3- Decrease costs through elimination lawsuits and the additional cost of treating medical error induced injuries.

Potential Impact of the Initiative/Project

The end goals of our project directly support the Quadruple Aim goals of providing "Better Care" and "Lower Costs" (Health.mil, 2013). By preventing medication errors we provide better, safer care for our patients which in turn lowers costs by eliminating lawsuits and the need to treat care induced injuries. We aim to align the handoff process through the high reliability organization principles of "obsession with failure", "reluctance to simplify," and "commitment to resilience" (Jacobson, G, 2019). We understand that even simple failures when providing care can have devastating sequelae for our patients. We aim to improve our resiliency by focusing on a weak point in our current process in order to reduce the chance of failure. We are also realistic about the complexity and tempo of the perioperative patient care environment. We must provide adequate tools to assist staff in the safe and efficient navigation of that complexity.

Alternatives (courses of action) chosen for Analysis

1- Implementation of the Written Handoff Anesthesia Tool (WHAT) on patients being transferred from the operating room to the post anesthesia care unit.
2- Formal implementation of Team STEPPS approved I-PASS report, on patients being transferred from the operating room to the post anesthesia care unit.
3- *"Status Quo"*: Allow non-formalized mixed use of verbal and written hand off communication.

Analysis of Alternatives

Alternative 1: 1. Implementation of the Written Handoff Anesthesia Tool (WHAT) on patients being transferred from the operating room to the post anesthesia care unit.

Pros	Cons
Tool has been externally validated. Improved adequacy and completeness of report. American Association of Nurse Anesthetist 2018 publication, support.	Duplication of charting. Extraneous charting for medications that are "very rarely" used. Anesthesia staff resistance to the current report of mixed handoffs to PACU RNs.

Alternative 2: Formal implementation of Team STEPPS approved I-PASS report, on patients being transferred from the operating room to the post anesthesia care unit.

Pros	Cons
Perioperative staff is already familiar with informal tool utilization Low fiscal cost needed to validate, streamline, and implement changes to informal tool. Stakeholder input incorporated with informal tool modifications. Allies for shared situation monitoring, situational awareness, and shared mental models.	New training needed for staff who will be working with modified informal tool. Removal of digital and printed forms of old tool will be required. Modifications of document as new standards and evidence-based practice emerge.

Alternative 3:	*"Status Quo"*: Continue to deliver report via non-formal mixed methods which include: SBAR, verbal report, a combination of the two methods, or other report methods varying by provider.

Pros	**Cons**
Minimal impact on current practice in the FBCH perioperative environment. Eliminates the need to provide education which decreases staff non-clinical time- most cost effective. No new forms to learn.	Allows for variance from provider to provider during patient handoffs. Increased risk of errors during and after patient handoffs between CRNA's and PACU RN's.

Assumptions

Standardized communication tools with critical medication doses and times will prevent omitted or overdosed medical errors.
Patient safety is valued as a priority amongst staff which should result in high buy-in from key stakeholders.

Recommendation and Rationale

Recommendation

Alternative 2 (Formal implementation of Team STEPPS approved I-PASS report, on patients being transferred from the operating room to the post anesthesia care unit).

Rationale

Of the three alternatives, alternatives 1 and 2 provide the greatest benefit for patient safety when compared to the status quo (alternative 3). However, with the duplicative and extraneous documentation required by alternative 1, alternative 2 offers a more streamlined approach with minimal additional time requirements of staff. Alternative 2 will also closely resemble the current informal tool already in use by some staff members. This familiarity should help to decrease resistance to change encountered during staff education and implementation.

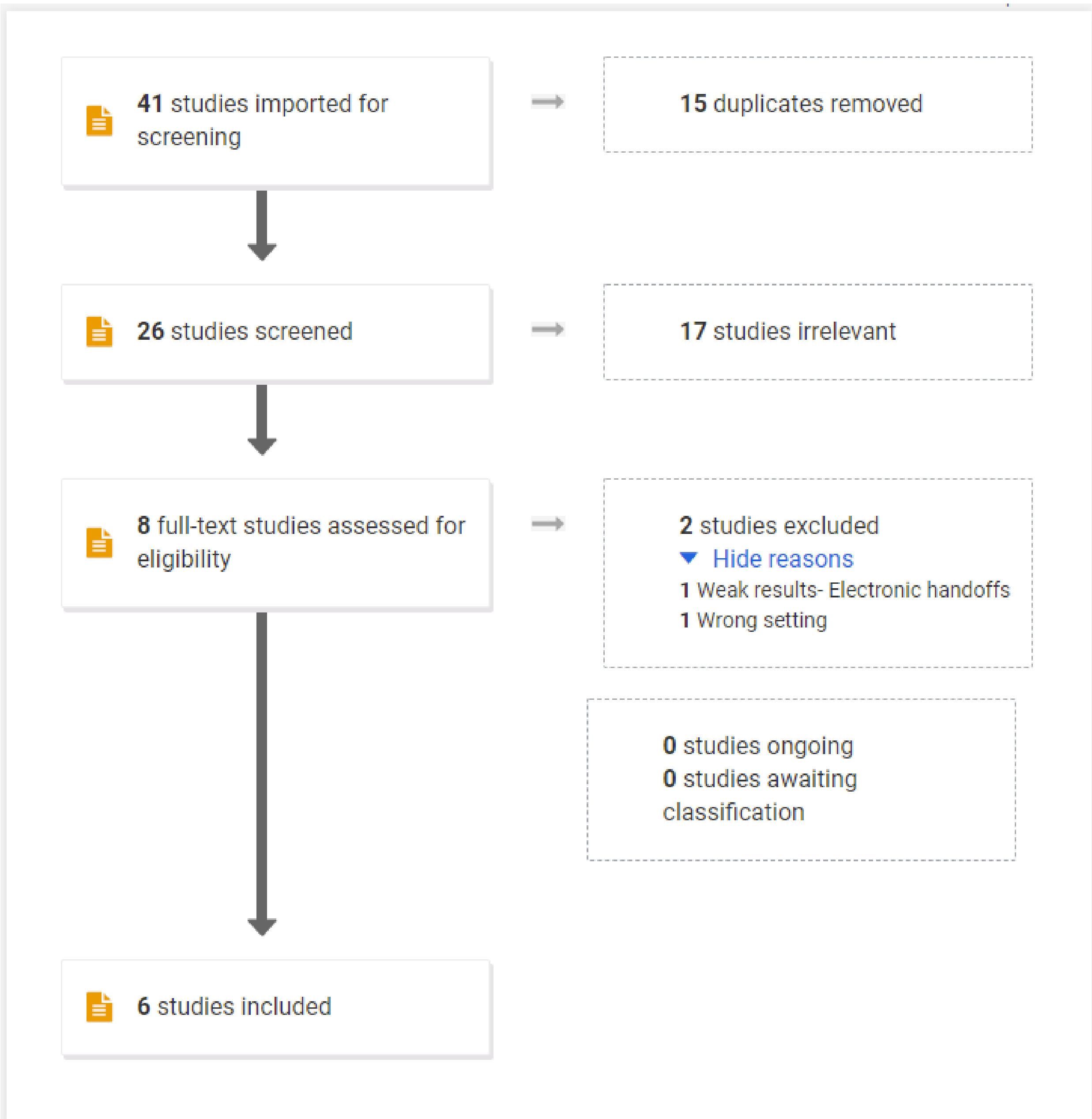
Value Based Care - Investment Required by the Organization and the Associated "VALUE" or $ GAINED.

Value = Quality + Service

I. Quality projected based on:

Patient Safety Related Benefit: According to AMPC, medication errors affect over 1.5 million Americans each year. We examined patient safety reports from Fort Belvoir Community Hospital for medication errors occurring in the PACU. At least two medication errors happened within the last 6 months (April-October 2021). According to AMPC, the average cost of patient morbidity and mortality from a medication error is roughly $51,000 (*Medication Errors*, 2019).	$204,000
Financial Benefit: According to the National Coordinating Council for Medications Error and Prevention (NCCMERP), the average extra medical cost for treating medication errors in hospitals alone is roughly $2,000 per error (*Medication Errors*, 2019).	$8,000

Appendix B: Prisma Diagram

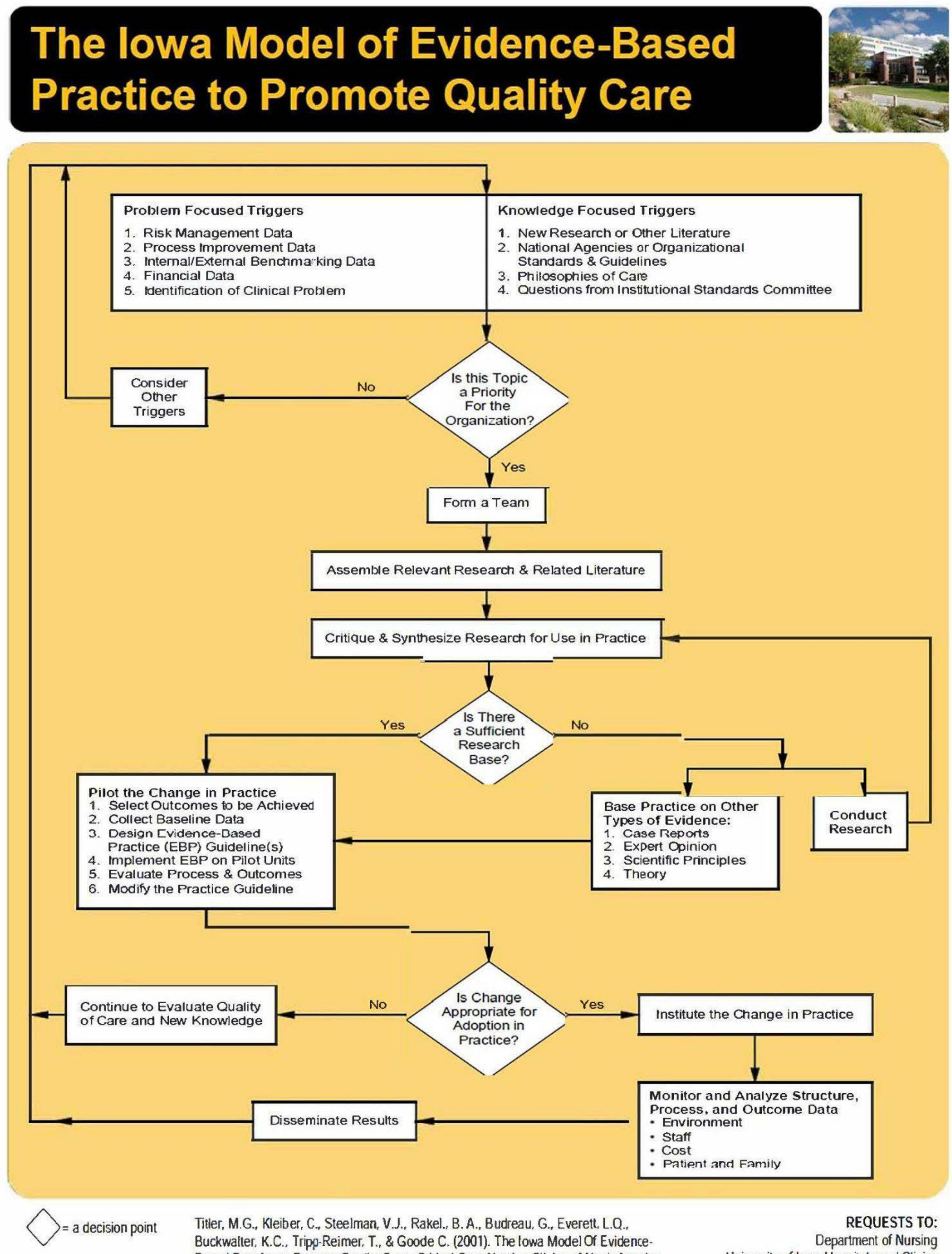


Appendix C: Evidence Table

1st Author Name (Publication Yr)						
Halterman, et al., 2019	Study Purpose/Aims	Research Questions/Hypotheses (IF different from/specifically described separately from study purpose & aims)	Study Design	Total Sample Size (How many initially, how many at final analysis?)	Sampling Plan	Independent Variables AND LEVEL OF MEASUREMENT
	1. To evaluate the benefits of implementing a checklist in the PACU in order to decrease the omission of health information during patient handoff.	Use of the checklist was hypothesized to improve information transher while also mainting continuity of care.	Patient handoffs were anonymously assessed by PACU RNs before and after the implementation of a handoff checklist with the Situation, Background, Assessment, and Recommendatioin (SBAR).	N=138: 78 patients prior to checklist implementation, 60 patients post checklist implementation.	Setting: US Hospital adult PACU. Convenience Sample INCLUSION: CRNA and PACU RN EXCLUSION: Pediatric patient population and all staff not directly giving or receiving post-anesthesia report	PACU Handoff communication tool --> NOMINAL/CATEGORICAL
	Dependent Variables AND LEVEL OF MEASUREMENT	Statistical Analyses - what tests were used for which research questions?	Results	Strengths (how promoted internal/external validity)	Weaknesses (biases; poorly controlled threats to internal/external validity)	LEVEL OF EVIDENCE - using JHNEBP tool (Strength and Quality)
	# of six key data items missing from evaluated patient handoffs - DISCRETE/Interval	A defective rate for handoff communication was calculated using proportional analysis. Inferential -	1. The results showed an improvement in the defective rate for handoffs. Preintervention data revealed key data was omitted at an average rate of 20%. Postintervention data revealed key data was omitted at a rate of 2.2%. Complete reports rose from 13% preintervention to 82% postintervention. Incomplete information was composed of six categories for handoffs.	1. No attrition amongst subjects. 2. Survey was streamlined for efficiency and quality with key stakeholders pre-trial.	1. Potential for confounders due to lack of randomization (convenience sampling). 2. External validity could be negatively impacted by convenience sampling. 3. Lack of thoughtful inclusion and exclusion criteria apart from job title and pediatric population. 4. Little prevention for potential bias with survey being completed by CRNA and PACU RN immediately post handoff. 5. Focused soley on PACU handoffs excluding ICU, and provider-to-provider communication. 6. Loud PACU environment was discussed as potential reason for missing information 6. No mention as to study condition consistency or any inferential statistical analysis being performed on data from SBAR checklist tool.	IIIB
Lambert, et al., 2016	Study Purpose/Aims	Research Questions/Hypotheses (IF different from/specifically described separately from study purpose & aims)	Study Design	Total Sample Size (How many initially, how many at final analysis?)	Sampling Plan	Independent Variables AND LEVEL OF MEASUREMENT
	1. To identify barriers and omissions in anesthesia handoffs between CRNAs and PACU RNs and between CRNAs during breaks. 2 To improve satisfaction with handoff report between CRNAs and PACU RNs	None specified	A quantitative preintervention-postintervention design was used. Step 1: A preintervention handoff tool was used to evaluate baseline handoff and satisfaction amongst CRNAs and PACU RNs. Step 2: Implement WHAT handoff tool to test for improved handoff communication and satisfaction.	N=37: 22 CRNAs and 15 PACU RNs	Setting: 350-bed US Hospital PACU. Convenience Sample INCLUSION: CRNA and PACU RN EXCLUSION: all staff not giving or receiving post-anesthesia report	PACU Handoff communication tool --> NOMINAL/CATEGORICAL CRNA and PACU RN satisfaction survey --> continuous/ratio/scale
	Dependent Variables AND LEVEL OF MEASUREMENT	Statistical Analyses - what tests were used for which research questions?	Results	Strengths (how promoted internal/external validity)	Weaknesses (biases; poorly controlled threats to internal/external validity)	LEVEL OF EVIDENCE - using JHNEBP tool (Strength and Quality)
	# of key data items missing from evaluated patient handoffs - DISCRETE/Interval CRNA and PACU RN satisfaction survey --> continuous/ratio/scale DISCRETE/Intverval variable	Chi-square and Fisher exact tests of the CRNA-to-PACU RN data and Mann-Whitney (U) to test the survey data. A defective rate for handoff communication was calculated using proportional analysis. Inferential - Chi-Square, Mann-Whitney (U)	1. The results showed an improvement in the defective rate for both CRNA-to-PACU RN and CRNA-to-CRNA handoffs. After implementation of the WHAT tool, CRNA-to-PACU RN communication defectiveness was decreased by 40%, while CRNA-to-CRNA handoff defectiveness was decreased by 80%. Incomplete information was composed of 23 categories for CRNA-to-PACU RN and 21 categories for CRNA-to-CRNA handoffs. Statistical significant improvement was seen in 12 of the PACU RN handoffs and 17 of the sole CRNA handoffs. 2. The results indicated a statistically significant increase in satisfaction with handoff communication after the use of the WHAT handoff tool for both groups, CRNAs (P < 0.001) and PACU RNs (P = 0.001)	1. No attrition amongst subjects. 2. High test reliability seen with median scored post-implementation scores consistently 40% improved. 3. Study conditions were consistently maintained with same staff, observers, and setting. 4. Survey was streamlined for efficiency and quality with key stakeholders pre-trial.	1. Potential for confounders due to lack of randomization (convenience sampling). 2. External validity could be negatively impacted by convenience sampling, however sample size was 40% larger than n required using priori power analysis. 3. Lack of thoughtful inclusion and exclusion criteria apart from job title. 4. Little prevention for potential bias with survey being completed by CRNA and PACU RN immediately post handoff. 5. Due to critical nature of handoff communication and increased publicity (Team STEPPS) there is also a risk for Publication Bias.	IIB
Park, et al., 2017	Study Purpose/Aims	Research Questions/Hypotheses (IF different from/specifically described separately from study purpose & aims)	Study Design	Total Sample Size (How many initially, how many at final analysis?)	Sampling Plan	Independent Variables AND LEVEL OF MEASUREMENT
	Establish measures to decrease perioperative miscommunication and improve patient safety through standardized PACU handoff protocol.	A physical checklist will increase data transfer and efficiency at our PACU, and prevent omission of pertinent patient information in handoff.	A cross-sectional observational study. Total duration of the study included 5 weeks of observation in the main PACU by dual seperate observers. 1. The first week preceded the study to make adjustments to the checklist as a pilot period. 2. Second and third weeks served as the control period, both anesthesia and surgical staff being observed were not informed of the reason for the presence of observers in PACU to avoid isolated improvements in handoff behavior 3.During the last two weeks of the study, anesthesia staff were asked to use the checklist by the observers before each report.	120 PACU handoffs observed (60 handoffs preimplementation and 60 post-implementation of the checklist)	Setting:PACU at Memorial Sloan Kettering Cancer Center (MSKCC); June 13, 2016 through July 15, 2016 convenience sampling. INCLUSION: Anesthesia and sugical staff EXCLUSION: all staff not giving or receiving post-anesthesia report	Anesthesia-PACU Checklist--> NOMINAL/CATEGORICAL
	Dependent Variables AND LEVEL OF MEASUREMENT	Statistical Analyses - what tests were used for which research questions?	Results	Strengths (how promoted internal/external validity)	Weaknesses (biases; poorly controlled threats to internal/external validity)	LEVEL OF EVIDENCE - using JHNEBP tool (Strength and Quality)
	# of key data items missing anesthesia handoffs -RATIO	Each item individually was examined to identify the proportion of handoffs addressed for the specific item between the two groups using Fisher's exact test. Wilcoxon rank sum test was used to evaluated of duration of PACU handoff is compared between the two groups.	1.Pre-implementation of a checklist, the composite value showed a mean of 8.7 (SD = 1.5) items reported out of a total of 12 items on the checklist, and postimplementation the median report increased to 10.9 items 2. Post-implementation of a checklist, reports about Allergies, Anesthesia Technique, and Airway all increased to 93% (56, N = 60, p <0.0001). In contrast, the least improvements in composite value were noted with Patient Name and Stability in 30 Minutes. Pre-implementation of a checklist, Patient Name and Stability in 30 Minutes were mentioned 55% (33, N = 60) and 20% (12, N = 60) of the handoffs, respectively. Post-implementation of a checklist, Patient Name and Stability in 30 Minutes increased to 88% (53, N = 60, p <0.0001) and 68% (41, N = 60, p < 0.0001) respectively.	1. No attrition amongst subjects. 2. High test reliability seen with median scored post-implementation anesthesiology scores increased from 5 to 9 and composite score values increased 9 to 11. 3. Study conditions were consistently maintained with same 2 observers and PACU setting.	1. Potential for confounders due to lack of randomization (convenience sampling). 2.Hawthorne effect is the influence of the presence of an observer on observed behavior. 3.Despite the 100% consensus made between two observers after every handoff, we cannot neglect the human variables in information gathering.	IIIB

Pucher, et al., 2015	Study Purpose/Aims	Research Questions/Hypotheses (IF different from/specifically described separately from study purpose & aims)	Study Design	Total Sample Size (How many initially, how many at final analysis?)	Sampling Plan	Independent Variables AND LEVEL OF MEASUREMENT
	1. To consolidate information in an effort to identify interventions that improve handovers in surgery and to assess compliance of described methods utilizing the Joint Commission handover improvement tools.	None specified	A systematic review was conducted of Observational Studies in Epidemiology (MOOSE) guidelines. Intervention types, methods and outcomes were compared utilizing the Joint Commission Standardization, Hardwiring, Allow, Reinforce, and Educate (SHARE) framework.	N=19 studies in final data synthesis, 23 Full-text assessed, 4 did not meet inclusion criteria	Studies were graded using the Newcastle-Ottawa Scale for cohort studies or the Jadad score for RCTs. INCLUSION: studies that reported effects of a handoff tool in post surgical patient population, pre and post-intervention studies, control and intervention groups EXCLUSION: Not discussed	PACU Handoff communication tool (5 studies using Electronic Medical Record tool, 14 studies using paper-based checklist) --> NOMINAL/CATEGORICAL
	Dependent Variables AND LEVEL OF MEASUREMENT	Statistical Analyses - what tests were used for which research questions?	Results	Strengths (how promoted internal/external validity)	Weaknesses (biases; poorly controlled threats to internal/external validity)	LEVEL OF EVIDENCE - using JHNEBP tool (Strength and Quality)
	Accuracy: # of key data items missing from evaluated patient handoffs - DISCRETE/Interval	Comparison of effect size was evaluated using standard deviations to determine the magnitude of difference between study means.	1. The results showed an improvement in the defective rate for post-anesthsia handoffs in all of the 19 studies included. The results suggest that a form of checklist may be effective in improving the accuracy and quality of a patient handoff. Many of the studies sought to standardize the handover process with a checklist.	1. High test reliability seen with post-implementation scores in each study showing repeatable improved scores. 2. Methods search section was discussed in detail providing search tool measures increasing validity. 3. All studies cited patient population and demographics, and attempts to space confounders equally across pre and postintervention groups.	1. The standard (SHARE) used throughout this research study to evaluate previous studies, was developed by the Joint Comission through an expert consultation process instead of evidence-based outcomes. 2. Many of the included studies had poor quality of methods while collecting data and lacked meaningful clinical outcomes. 3. Interpretation of findings is diminished by the lack of blinding of evaluators, randomization of subjects and adjustment of confounding variables.	IA
Randmaa, et al., 2019	Study Purpose/Aims	Research Questions/Hypotheses (IF different from/specifically described separately from study purpose & aims)	Study Design	Total Sample Size (How many initially, how many at final analysis?)	Sampling Plan	Independent Variables AND LEVEL OF MEASUREMENT
	1. To investigate different professionals' (nurese anaesthetists', anaethesiologists', and postanaesthesia care unit nurses') description of and reflections on the postoperative handover.	None specified	A focus group interview study witha descriptive design (qualitative) content analysis of transcripts	N=23: 8 CRNAs, 7 Anaesthesiologiists, and 8 PACU RNs	Setting: Anaesthesia clinics at 2 Sweden Hospitals. Purposive Sample INCLUSION: CRNA, Anaesthesiologits, and PACU RN EXCLUSION: Any staff not listed in the inclusion criteria	NA
	Dependent Variables AND LEVEL OF MEASUREMENT	Statistical Analyses - what tests were used for which research questions?	Results	Strengths (how promoted internal/external validity)	Weaknesses (biases; poorly controlled threats to internal/external validity)	LEVEL OF EVIDENCE - using JHNEBP tool (Strength and Quality)
	NA	Inductive analysis using qualitative content utilizing codes and grouping to assemple categorical domains.	Five categories emerged: 1: Having different temporal foci during handover. 2: Insecurity when the information is transfered from one team to another. 3: Striving to ensure quality of the handover. 4: Weighing the advantages and disadvanges of the bedside handover. 5: having different perspectives on the transfer of responsiilities. Each of these 5 categories were composed of subcategories. Of note and important to the purpose of this project: All subjects felt insecure about having all the information needed and believed that having structured memory written aids would improve cooperation and data transfer between teams.	1: Focus group interviews have wider range of views through group interaction than individual interviews. 2: Interviews conducted using profession-based groups. 3: Assistant moderator observed the focus group interviews and all participants agreed on the summary.	1: Small sample size drawn from two similar hospitals	VA
Segall, et al., 2012	Study Purpose/Aims	Research Questions/Hypotheses (IF different from/specifically described separately from study purpose & aims)	Study Design	Total Sample Size (How many initially, how many at final analysis?)	Sampling Plan	Independent Variables AND LEVEL OF MEASUREMENT
	To systematically review the literature on handover of care from the operating room to postanesthesia or intensive care units and summerize process and communication recommendations based on those findings.	None specified	Meta-analysis	Initial: >500 papers; Final: 31 papers. Category 1: 4 papers (comprehensive intervention based studies. Category 2: 5 papers (Intervention based studies). Category 3: 18 papers (pre-intervention studies). Category 4: 4 papers (Published opinions/reviews)	Various: Meta-analysis. Inclusion criteria: All papers that addressed patient transfers from the OR to the Pacu or ICU were included in the literature review. Exclusion: Papers on the other handover types, e.g., work shift changes, and those discussing transfers not originating in the OR	Various: Meta-analysis
	Dependent Variables AND LEVEL OF MEASUREMENT	Statistical Analyses - what tests were used for which research questions?	Results	Strengths (how promoted internal/external validity)	Weaknesses (biases; poorly controlled threats to internal/external validity)	LEVEL OF EVIDENCE - using JHNEBP tool (Strength and Quality)
	Various: Meta-analysis	Various: Meta-analysis	All category 1 papers plus 5 additional papers showed significant support from handover training initiatives and the creation of printed or electronic postoperative reports. Most of the papers provided quantitive or qualitative descriptions of current post-surgical care transfer barriers that had a striking consistency despite being observed across multiple sites: incomplete information, poor standardization/organization, information overload.	Meta-analysis analyizing papers from numerous categories and various sites.	1. Only 4/31 papers were considered category 1 (comprehensive intervention based) with no indepth description of blinding. 2. No description of exclution criteria based on bias, confounding variable, or strength of study. 3. No discussion of combination of individual quantitative results using statistical methods.	IB

Appendix D: Iowa Model



Titler, M.G., Kleiber, C., Steelman, V.J., Rakel., B. A., Budreau, G., Everett, L.Q., Buckwalter, K.C., Tripp-Reimer, T., & Goode C. (2001). The Iowa Model Of Evidence-Based Practice to Promote Quality Care. *Critical Care Nursing Clinics of North America*, 13(4), 497-509.

REQUESTS TO:
Department of Nursing
University of Iowa Hospitals and Clinics
Iowa City, IA 52242-1009

Appendix E: Formalized Communication Tool

PeriOp IPASS

I/P	ADMIN	Place PT Sticker here ☐ Consent Patient: ______________________ Surgeon: ______________ DOS: __________
A	PAU	**ALLERGIES**: ________________________________ Orders ☐ YES ☐ NO T ____.___°f BP _____/_____ P _____ R _____ SpO2 _____% HT _____" WT _____ lb/kg preOp Date: __________ H&P Date: __________ ☐Dental Clearance ☐ PT will see ANES DOS
	LABS & RAD	**PAU:** ☐BMP/CMP ☐CBC ☐PT/PTT ☐T&S ☐T&S #2 ☐C&S ☐UA ☐CXR ☐ EKG **DOS**: ☐BMP/CMP ☐CBC ☐PT/PTT ☐T&S ☐T&S #2 ☐C&S ☐UA ☐CXR ☐ EKG ☐Other ______________ **HCG** ☐NEG ☐POS **FBS** ______mg/dl **COVID** ☐NEG ☐POS
	DAY OF SURGERY	T ____.___°f BP _____/_____ P _____ R _____ SpO2 _____% HT _____" WT _____ lb/kg **NPO**: ____________ **Last Void**: ________ ☐**Contact Precautions** ______________ **MEDS IN PHP**: ____ ____ **ESCORT**: ______________________________ **CELL**: (______) ________-_________
S	MAIN OR	**ANESTHESIA:** MAC, GETA, Block: ______________ **PMH/PSH:** **ANTIBIOTICS:** Ancef, Clindamycin, Doxycycline, Zosyn, Flagyl, Unasyn, Rocephin **MEDS/LOCAL:** ERAS, EXPAREL, Bupivacaine, Lidocaine (with/without epi), BellaDonna **DRESSING:** Ice-Man/Brace/Sling/Ace Wrap/Xeroform/Mepilex/Dermabond/Surgical Bra/Fluffs/Peripad **DRAINS/CATHETER:** JP_____, NG _____, WoundVac _____, Foley _____
	PACU/ ANESTHESIA	**ANESTHESIA PROVIDER:** **MEDS:** Fentanyl: ______ Versed: ______ Dilaudid: ______ Propofol: ______ Ketamine: ______ Other: _____ Zofran: ______ Decadron: _____ Toradol: _____ IV Tylenol: ______ Narcan: ______ **Input and Output:** **Input:** LR: ______ NS: ______ HESPAN: ______ Blood Products: ______ **Output:** EBL: ______ UOP: ______ JP: ______ NGT: ______
S		☐**Isolation Precautions** ____________ ☐**Critical Lab/Xray Needed** ______________ ☐ **Blood Product Administered** ______________ ☐**Seizure/Falls Risk** ____________

Appendix F: Data Analysis Table

The FREQ Procedure

Frequency / Percent / Row Pct / Col Pct

Table of PRE_POST by OPTION

PRE_POST	OPTION A	OPTION B	OPTION C	Total
POS	6 7.14 15.38 33.33	13 15.48 33.33 28.26	20 23.81 51.28 100.00	39 46.43
PRE	12 14.29 26.67 66.67	33 39.29 73.33 71.74	0 0.00 0.00 0.00	45 53.57
Total	18 21.43	46 54.76	20 23.81	84 100.00

Statistics for Table of PRE_POST by OPTION

Statistic	DF	Value	Prob
Chi-Square	2	30.4223	<.0001
Likelihood Ratio Chi-Square	2	38.3285	<.0001
Mantel-Haenszel Chi-Square	1	17.8849	<.0001
Phi Coefficient		0.6018	
Contingency Coefficient		0.5156	
Cramer's V		0.6018	

Sample Size = 84

The FREQ Procedure

Frequency / Percent / Row Pct / Col Pct

Table of PRE_POST by OPTION

PRE_POST	OPTION A	OPTION B	Total
POS	6 9.38 31.58 33.33	13 20.31 68.42 28.26	19 29.69
PRE	12 18.75 26.67 66.67	33 51.56 73.33 71.74	45 70.31

Table of PRE_POST by OPTION

PRE_POST	OPTION A	OPTION B	Total
Total	18 28.13	46 71.88	64 100.00

Statistics for Table of PRE_POST by OPTION

Statistic	DF	Value	Prob
Chi-Square	1	0.1595	0.6896
Likelihood Ratio Chi-Square	1	0.1574	0.6916
Continuity Adj. Chi-Square	1	0.0090	0.9243
Mantel-Haenszel Chi-Square	1	0.1570	0.6920
Phi Coefficient		0.0499	
Contingency Coefficient		0.0499	
Cramer's V		0.0499	

Fisher's Exact Test	
Cell (1,1) Frequency (F)	6
Left-sided Pr <= F	0.7617
Right-sided Pr >= F	0.4549
Table Probability (P)	0.2167
Two-sided Pr <= P	0.7643

Sample Size = 64

The FREQ Procedure

Frequency Percent Row Pct Col Pct

Table of PRE_POST by OPTION

PRE_POST	OPTION A	OPTION C	Total
POS	6 15.79 23.08 33.33	20 52.63 76.92 100.00	26 68.42

Table of PRE_POST by OPTION			
	OPTION		
PRE_POST	A	C	Total
PRE	12 31.58 100.00 66.67	0 0.00 0.00 0.00	12 31.58
Total	18 47.37	20 52.63	38 100.00

Statistics for Table of PRE_POST by OPTION

Statistic	DF	Value	Prob
Chi-Square	1	19.4872	<.0001
Likelihood Ratio Chi-Square	1	24.4833	<.0001
Continuity Adj. Chi-Square	1	16.5238	<.0001
Mantel-Haenszel Chi-Square	1	18.9744	<.0001
Phi Coefficient		-0.7161	
Contingency Coefficient		0.5822	
Cramer's V		-0.7161	

Fisher's Exact Test	
Cell (1,1) Frequency (F)	6
Left-sided Pr <= F	<.0001
Right-sided Pr >= F	1.0000
Table Probability (P)	<.0001
Two-sided Pr <= P	<.0001

Sample Size = 38

The FREQ Procedure

Frequency Percent Row Pct Col Pct

Table of PRE_POST by OPTION			
	OPTION		
PRE_POST	B	C	Total

Table of PRE_POST by OPTION

PRE_POST	OPTION B	OPTION C	Total
POS	13 19.70 39.39 28.26	20 30.30 60.61 100.00	33 50.00
PRE	33 50.00 100.00 71.74	0 0.00 0.00 0.00	33 50.00
Total	46 69.70	20 30.30	66 100.00

Statistics for Table of PRE_POST by OPTION

Statistic	DF	Value	Prob
Chi-Square	1	28.6957	<.0001
Likelihood Ratio Chi-Square	1	36.7186	<.0001
Continuity Adj. Chi-Square	1	25.8978	<.0001
Mantel-Haenszel Chi-Square	1	28.2609	<.0001
Phi Coefficient		-0.6594	
Contingency Coefficient		0.5505	
Cramer's V		-0.6594	

Fisher's Exact Test	
Cell (1,1) Frequency (F)	13
Left-sided Pr <= F	<.0001
Right-sided Pr >= F	1.0000
Table Probability (P)	<.0001
Two-sided Pr <= P	<.0001

Sample Size = 66

Appendix G: Project Timeline

Project Year 1 (2021)												
ACTIVITY/MONTH	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**
Assignment and Research				X	X	X	X	X	X			
USUHS VPR Submission and Approval									X	X	X	X
Site IRB Submission and Approval										X	X	X
Pre-implementation data collection												
Staff Education												
Project Implementation												
Post-implementation data collection												
Data Analysis												
Dissemination												
Project Year 1 (2022)												
ACTIVITY/MONTH	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**
Assignment and Research												
USUHS VPR Submission and Approval												
Site IRB Submission and Approval	X	X										
Pre-implementation data collection			X	X	X	X						
Staff Education							X	X				
Project Implementation									X	X		
Post-implementation data collection											X	X
Data Analysis												
Dissemination												
Project Year 1 (2023)												
ACTIVITY/MONTH	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**
Assignment and Research												
USUHS VPR Submission and Approval												
Site IRB Submission and Approval												
Pre-implementation data collection												
Staff Education												
Project Implementation												
Post-implementation data collection												
Data Analysis	X	X	X	X								
Dissemination					X							

Appendix H: Data Collection Template

	Tool Used			
Provider Observed	None	Informal	IPASS	TOTAL
A				0
B				0
C				0
D				0
E				0
F				0
G				0
H				0
I				0
J				0
K				0
L				0
M				0
N				0
O				0
P				0
Q				0
R				0
S				0
T				0
U				0
V				0
W				0
X				0
Y				0
Z				0
AA				0
BB				0
CC				0
DD				0
EE				0
FF				0
	0	0	0	0

Appendix I: DNP Project Team Mentor Agreement Form

DOCTOR OF NURSING PRACTICE PROJECT
DNP Project Clinical Question and Team Mentor (Committee Membership) Agreement Form

Graduation Year: 2023

Name(s) of DNP Project Student Team:

1. Aguirre, Francisco Phase II Site: AGCNS ☐ FNP ☐ PMHNP ☒ RNA ☐ WHNP ☐

2. Drebenstedt, Reagan Phase II Site: AGCNS ☐ FNP ☐ PMHNP ☒ RNA ☐ WHNP ☐

3. Henderson, Eric Phase II Site: AGCNS ☐ FNP ☐ PMHNP ☒ RNA ☐ WHNP ☐

4. Sokolowski, Adam Phase II Site: AGCNS ☐ FNP ☐ PMHNP ☒ RNA ☐ WHNP ☐

5. ________ Phase II Site: AGCNS ☐ FNP ☐ PMHNP ☐ RNA ☐ WHNP ☐

6. ________ Phase II Site: AGCNS ☐ FNP ☐ PMHNP ☐ RNA ☐ WHNP ☐

The tentative title of the DNP Project Proposal for this student group is:
Improving Handoffs from the Operating Room to the Post Anesthesia Care Unit.

Committee Approved DNP Project Clinical Question:
Among anesthesia providers and PACU Registered Nurses at FBCH, how does a standardized handoff tool compare to the current SBAR handoff methods improve communication of administered intraoperative medications?

Names of DNP Project Team Mentors *(type the name and obtain signatures)*:

I agree to serve as a member of the DNP Project Team (Team Mentors) for the above DNP Student Project Team. As a Project Team Mentor, I agree to the duties and responsibilities outlined within the DNP Project Manual which include but are not limited to the provision of consultation and guidance supporting the entire DNP project journey and to ensure the DNP project is of sufficient rigor and demonstrates doctoral level scholarship to meet the requirements for USUHS GSN graduation.

Form Version: 1 Jun 2016

NOTE: *You may have 3-4 DNP Team Mentors [committee members including your DNP Senior Mentor (Chair)]. The Phase II Site Director may also be a member of the group, as well as other USUHS faculty or others who may serve as content experts.* ***All non-USUHS faculty selected as a Team Mentor must be approved by the DNP Project Director.***

Senior Mentor (Chair):	Sandra Bruner	Signature:	BRUNER.SANDRA.SUE.1102080803 Digitally signed by BRUNER.SANDRA.SUE.1102080803	Date:	01MAR2022
Team Mentor (Committee):	LTC Todd Morris	Signature:	MORRIS.TODD.ANDREW.1241084007 Digitally signed by MORRIS.TODD.ANDREW.1241084007	Date:	01MAR2022
Team Mentor (Committee):		Signature:		Date:	
Team Mentor (Committee):		Signature:		Date:	

Form Version: 1 Jun 2016

Appendix J: CITI Certificates

CITI PROGRAM

Completion Date 08-Apr-2021
Expiration Date 07-Apr-2024
Record ID 42011852

This is to certify that:

Francisco Aguirre

Has completed the following CITI Program course:

Not valid for renewal of certification through CME.

OUSD P&R Human Research
(Curriculum Group)
Biomed Research Coordinators, Clinical Coordinators, Study Coordinators & Research Administrators
(Course Learner Group)
1 - Basic Course
(Stage)

Under requirements set by:

Office of the Under Secretary of Defense (Personnel and Readiness)

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w6033e55a-ba78-40ea-94cb-3026e9fe0695-42011852

CITI PROGRAM

Completion Date 17-Apr-2021
Expiration Date 16-Apr-2024
Record ID 42015079

This is to certify that:

Reagan Drebenstedt

Has completed the following CITI Program course:

Not valid for renewal of certification through CME.

OUSD P&R Human Research
(Curriculum Group)
Biomed Research Coordinators, Clinical Coordinators, Study Coordinators & Research Administrators
(Course Learner Group)
1 - Basic Course
(Stage)

Under requirements set by:

Office of the Under Secretary of Defense (Personnel and Readiness)

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w339fead8-93c3-4170-97b5-274fa51210af-42015079

CITI PROGRAM

Completion Date 06-Apr-2021
Expiration Date 05-Apr-2024
Record ID 41966102

This is to certify that:

Eric Henderson

Has completed the following CITI Program course:

Not valid for renewal of certification through CME.

OUSD P&R Human Research
(Curriculum Group)
Biomed Research Coordinators, Clinical Coordinators, Study Coordinators & Research Administrators
(Course Learner Group)
1 - Basic Course
(Stage)

Under requirements set by:

Office of the Under Secretary of Defense (Personnel and Readiness)

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?wa3544209-db40-4d15-9241-eea37401af8b-41966102

CITI PROGRAM

Completion Date 15-Apr-2021
Expiration Date 14-Apr-2024
Record ID 42088343

This is to certify that:

Adam Sokolowski

Has completed the following CITI Program course:

Not valid for renewal of certification through CME.

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

Under requirements set by:

Office of the Under Secretary of Defense (Personnel and Readiness)

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w07186524-63dd-44c1-85fe-82ed5adbf63a-42088343

Appendix K: USUHS FORM3202N

USUHS FORM 3202N
DANIEL K. INOUYE GRADUATE SCHOOL OF NURSING
EVIDENCE-BASED PRACTICE/PERFORMANCE IMPROVEMENT PROPOSAL

VPR Date Stamp

Project Number: **GSN-61-13060** (VPR will assign)

Project Title: **Improving Transitions from the Operating Room to the Post Anesthesia Care Unit**

SECTION A: STUDENT POC INFORMATION

1. Name (Last, First, MI): **Henderson, Eric, A** Student E-mail: **eric.henderson@usuhs.edu**
2. Home Address: [redacted] Cell Number: [redacted]

SECTION B: COMMITTEE CHAIR / SENIOR MENTOR INFORMATION

3. Name (Last, First, MI): **Bruner, Sandra**
4. Telephone: [redacted] Fax: E-mail: **Sandra.Bruner@usuhs.edu**
5. USUHS Building/ Room No.:

SECTION C: PROJECT INFORMATION

6. Attach the Abstract for the proposal, including the following sections: Site Location of the Project, Title, Authors, Background or Problem/Issue, Clinical Question/Purpose, Project Design, Anticipated Organizational Impact/Implications for Practice and also include the Proposed Timeline. Single space the abstract and use Times New Roman font, size 12.
7. Is this proposal related to an active research project of the Chair/Senior Mentor identified in Section B? ☐ Yes ☒ No
   If yes, complete below; if no, proceed to Part 8.
   Project Number: __________
   Project Title:
   Project Start Date: __________ Project End Date: __________
8. Anticipated period of performance: Project Start Date: **9/1/2021** Project End Date: **3/30/2023**
9. Performance Site(s): **Fort Belvoir Community Hospital**
10. Does this project involve any classified information? (Contact the USUHS Security Office for guidance) ☐ Yes ☒ No
11. Do you have a funding source for this project? ☐ Yes ☒ No ☐ NA
    If yes, specify the funding agency and the amount provided:

SECTION D: SIGNATURES

The following signatures attest to the validity of the above information:

HENDERSON.ERIC.A.1380509586 Digitally signed by HENDERSON.ERIC.A.1380509586 Date: 2022.09.20 19:35:02 -04'00'	BRUNER.SANDRA.SUE.1102080803 Digitally signed by BRUNER.SANDRA.SUE.1102080803 Date: 2022.09.21 15:18:22 -04'00'
Student (Project Point of Contact for the Group) (Signature and Date)	Chair/Senior Mentor (Signature and Date)
	BARBER.KENNETH.DOUGLAS.1177263644 Digitally signed by BARBER.KENNETH.DOUGLAS.1177263644 Date: 2022.09.26 09:19:36 -04'00'
Chair/Program Director (Signature and Date)	Chair/Program Director (Signature and Date)
	Laura Taylor, PhD, RN, ANEF, FAAN Digitally signed by Laura Taylor, PhD, RN, ANEF, FAAN Date: 2022.09.26 09:39:44 -04'00'
DNP Project Director or PhD Director (Signature and Date)	Associate Dean for Academic Affairs, GSN (Signature and Date)
SIMMONS.ANGELA.MARIE.1143313375 Digitally signed by SIMMONS.ANGELA.MARIE.1143313375 Date: 2022.10.24 15:34:38 -04'00'	ROMANO.CAROL.A.1032050294 Digitally signed by ROMANO.CAROL.A.1032050294 Date: 2022.10.27 16:28:32 -04'00'
Associate Dean for Research, GSN (Signature and Date)	Dean, DKI Graduate School of Nursing (Signature and Date)

In light of the above signatures, the project is approved.

WOODBERRY.MITCHELL.WAYNE.1060957114 Digitally signed by WOODBERRY.MITCHELL.WAYNE.1060957114 Date: 2022.12.09 08:57:35 -05'00'

USUHS Vice President for Research Date

USUHS Form 3202N (VPR) - Revised Sep 2015 v1.2
Previous versions are obsolete

Appendix L: PI Letter of Determination

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

DETR-DRP 20 January 2022

MEMORANDUM FOR: Eric A. Henderson, MAJ, Fort Belvoir Community Hospital (FBCH)

SUBJECT: Not Research Status Determination

STUDY TITLE:
Improving Transitions from the Operating Room to the Post Anesthesia Care Unit

EIRB Reference # 944040

PROTOCOL # 944040

REVIEW TYPE: Administrative

ACTION: NOT RESEARCH STATUS DETERMINATION

DETERMINATION DATE: 18 JAN 2022

1. This letter is in response to your request for a "not research" determination for the above-referenced project. The following documents were reviewed:

    a. EIRB Protocol Template (Version 1.1)

2. A Fort Belvoir Community Hospital (FBCH) Exemption Determination Official has reviewed your proposed project and has determined that your project does not meet the definition of research as defined under 32 CFR 219.102(l).

3. Research is defined under 32 CFR 219.102(l) as follows:

"Research means a systematic investigation, including research development, testing, and evaluation, designed to develop or contribute to generalizable knowledge."

4. Based on the information you provided, the proposed project does not meet the definition of research because:

    a. It is not a systematic investigation. The proposed project involves building on existing literature to ascertain the benefit of implementing a standardized anesthesia hand off tool in the FBCH Post Anesthesia Care Unit (PACU).

DETR-DRP
SUBJECT: Not Research Status Determination

b. It is not designed to develop or contribute to generalizable knowledge. The project is intended to develop and evaluate the implementation of a standardized communication tool that can help reduce the risk of information loss and is independent of the communication abilities of the provider and the condition of the patient as it relates to acuity in the immediate post-operative period.

5. Because this project has been determined to be "not research," it is not subject to further review by the Institutional Review Board (IRB). **This determination should not be construed as approval to initiate the project.** Other institutional approvals may be required and should be coordinated through your preceptor's department.

6. Any collection of information via surveys as defined by DoDI 8910.01 must comply with DoDI 1100.13 "DoD Surveys." It is the responsibility of the Project Lead to ensure that any additional reviews and approvals specific to these regulations are obtained.

7. Your project may become research subject to IRB review if it is modified to include a systematic investigation to develop or contribute to generalizable knowledge. Please notify the FBCH Human Research Protections Program Office of any proposed modifications to the project that may result in a change in status.

8. Publication clearance is required prior to the release of any information outside of the institution. Please contact the Fort Belvoir Community Hospital Department of Research Programs (DRP) for specific requirements.

9. The POC for this determination is the Human Research Protections Program Office, Fort Belvoir Community Hospital at (571) 231-2537.

1/20/2022

X Michelle Johnson

Michelle Johnson, Ph.D.
FBCH Exempt Determination Official
Signed by: USA

FBCH Determination Official

Appendix M: PAO Clearance

Appendix M: DNP Project Completion Verification Form

Improving Transitions from the Operating Room to the Post Anesthesia Care Unit

Francisco Aguirre, BSN, RN, MAJ, AN; Reagan Drebenstedt, BSN, RN, MAJ, AN;
Eric Henderson, BSN, RN, MAJ, AN; Adam Sokolowski, BSN, RN, LTC, AN
Daniel K. Inouye Graduate School of Nursing, Uniformed Services University of the Health Sciences, Bethesda, MD
Fort Belvoir Community Hospital, Fort Belvoir, VA

Significance of the Problem

- The Joint Commission identified miscommunication as the number one contributor of anesthesia related sentinel events.[1]
- Discontinuity in documentation systems, utilized by Fort Belvoir anesthesia and perioperative staff, created potential for miscommunication and medication errors.
- Potential gaps in verbal communication, during handoff from the anesthesia provider to the post-anesthesia care (PACU) nursing staff, may increase the risk of medication errors and potential for patient harm.

Purpose

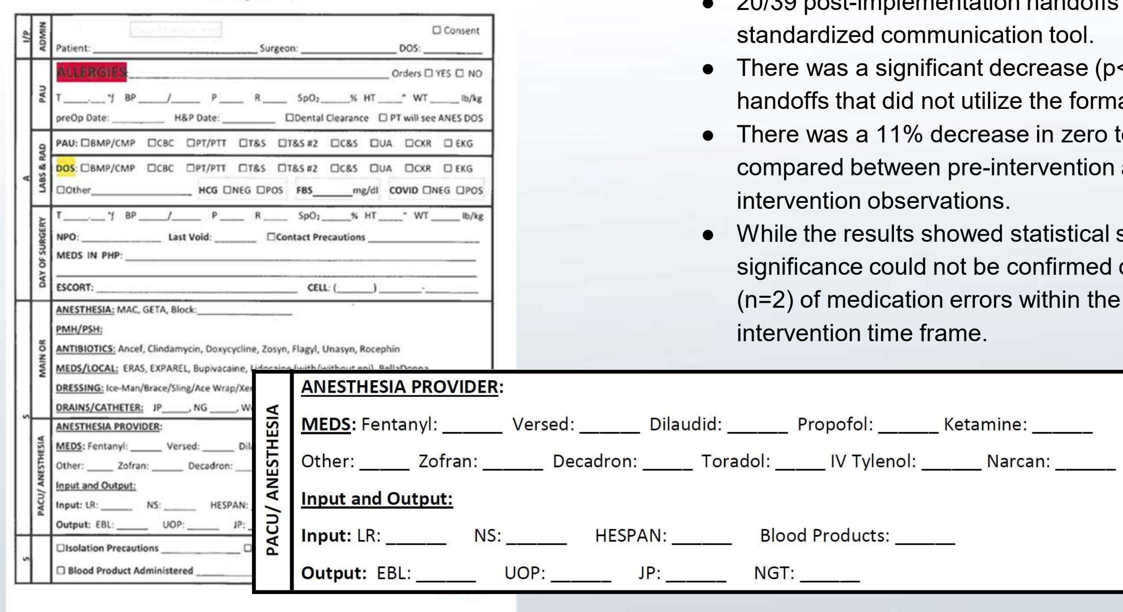
This purpose of this evidence-based project was to implement and evaluate the use of a standardized handoff tool between anesthesia providers and PACU nurses,

Project Design

Clinical Problem: Two medication errors related to dosing frequency of analgesic medications in the PACU.

- Utilizing the Iowa Model Revised Framework, a literature review was conducted, evidence synthesized, and an evidence-based solution was developed.
- Handoff communication methods were observed pre-implementation.
- A standardized handoff communication tool was developed, staff education completed, and the tool was implemented.
- Handoff communication methods were observed post-implementation.
- Pearson's Chi-square test was utilized to analyze data and compile results.

Standardized Tool


PeriOp IPASS

I/P | ADMIN: ☐ Consent; Patient: ______ Surgeon: ______ DOS: ______

PAU: ALLERGIES ______ Orders ☐ YES ☐ NO; T ____.___ °f BP ____/____ P ____ R ____ SpO2 ____% HT ____" WT ____ lb/kg; preOp Date: ______ H&P Date: ______ ☐Dental Clearance ☐ PT will see ANES DOS

LABS & RAD: PAU: ☐BMP/CMP ☐CBC ☐PT/PTT ☐T&S ☐T&S #2 ☐C&S ☐UA ☐CXR ☐ EKG; DOS: ☐BMP/CMP ☐CBC ☐PT/PTT ☐T&S ☐T&S #2 ☐C&S ☐UA ☐CXR ☐ EKG; ☐Other______ HCG ☐NEG ☐POS FBS ______mg/dl COVID ☐NEG ☐POS

DAY OF SURGERY: T ____.___ °f BP ____/____ P ____ R ____ SpO2 ____% HT ____" WT ____ lb/kg; NPO: ______ Last Void: ______ ☐Contact Precautions ______; MEDS IN PHP: ______; ESCORT: ______ CELL: (____) ____-____

MAIN OR: ANESTHESIA: MAC, GETA, Block:______; PMH/PSH:; ANTIBIOTICS: Ancef, Clindamycin, Doxycycline, Zosyn, Flagyl, Unasyn, Rocephin; MEDS/LOCAL: ERAS, EXPAREL, Bupivacaine, ...; DRESSING: Ice-Man/Brace/Sling/Ace Wrap/...; DRAINS/CATHETER: JP____, NG ____, ...

PACU/ ANESTHESIA:

ANESTHESIA PROVIDER:

MEDS: Fentanyl: ______ Versed: ______ Dilaudid: ______ Propofol: ______ Ketamine: ______

Other: _____ Zofran: ______ Decadron: ______ Toradol: _____ IV Tylenol: ______ Narcan: ______

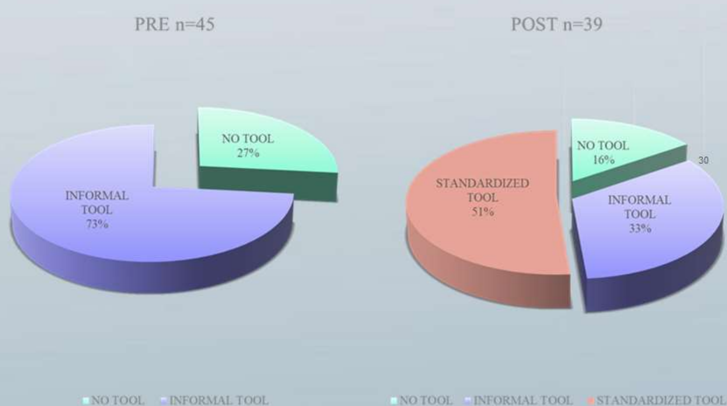
Input and Output:

Input: LR: ______ NS: ______ HESPAN: ______ Blood Products: ______

Output: EBL: ______ UOP: ______ JP: ______ NGT: ______

S: ☐Isolation Precautions ______; ☐ Blood Product Administered ______

Results



Analysis of Data

- 20/39 post-implementation handoffs utilized the standardized communication tool.
- There was a significant decrease ($p<0.001$) in patient handoffs that did not utilize the formalized tool.
- There was a 11% decrease in zero tool utilization as compared between pre-intervention and post-intervention observations.
- While the results showed statistical significance, clinical significance could not be confirmed due to low number (n=2) of medication errors within the six-month pre-intervention time frame.

Recommendations

- Research supports utilizing a standardized communication tool with staff by-in to improve communication compliance.
- New improvement projects and evaluating metrics will need to be utilized once MHS Genesis, electronic health record, transitions have been accomplished.

1. Park, L. S., Yang, G., Tan, K. S., Wong, C. H., Oskar, S., Borchardt, R. A., & Tollinche, L. E. (2017). Does Checklist implementation improve quantity of data transfer: An observation in postanesthesia care unit (PACU). *Open Journal of Anesthesiology*, *7*(4), 69–82. https://doi.org/10.4236/ojanes.2017.74007

"The authors would like to acknowledge LTC (Ret.) Sandra Bruner (Senior Mentor), LTC Todd Morris, LCDR Kenneth Barber, and Dr. Hind Baydoun, for their support, guidance, and assistance. Their time, effort, and dedication to this project is greatly appreciated.

IMPROVING TRANSITIONS FROM THE OPERATING ROOM TO THE POST ANESTHESIA CARE UNIT

Francisco Aguirre MAJ, Reagan Drebenstedt MAJ, Eric Henderson MAJ, and Adam Sokolowski LTC

Dr. Sandra S. Bruner

DNP Project Team

Phase II Todd Morris, LTC

Fort Belvoir Community Hospital

The Daniel K. Inouye Graduate School of Nursing

Doctor of Nursing Practice Project

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Disclaimer

- The views expressed in the presentation are those of the authors and do not necessarily reflect the official policy or position of the Uniformed Services University, the Department of Defense, or the United States Government

- There are no financial relationships that exist between the speakers and a commercial entity

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HIPAA Concerns

- No patient data was collected at any time during this project
  - No identifiable information was gathered
  - Date and time of surgical procedures were not documented
  - Only handoff tool utilizations were documented

- Providers were tracked to ensure adequate range of sample population
  - Providers names were codified in the data collection table
  - No provider information was directly correlated with data collection

Introduction

- Where: Fort Belvoir Community Hospital
- Who: Anesthesia providers and PACU Staff
- What: Barriers to communication during patient transition from OR to PACU
- When: Evaluation of 6 months of patient safety reports demonstrated 2 incidents of medication double dosing as a result of medications being given in the OR and the PACU due to inadequate communication
- Why: Medication errors have the potential to cause patient harm and a financial burden of approximately $212,000 per year (*Medication Errors*, 2019)

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Problem Synthesis

- Solving communication breakdowns during PACU hand-offs would significantly reduce the cost of medical errors while potentially reducing morbidity and mortality

- A standardized communication tool can reduce information loss

- The transition point from the operating room to the PACU entails potential risk for the patient that incomplete communication can exacerbate

Relevance to Military Nursing

- The impact of a flawed Military Health System on the Combatant Commander decreases the number of service members available to conduct operations
- These limitations impact mission readiness, combat power, and total force projection
- Additionally, the potential to save a portion of the $12 billion dollars lost annually would decrease per capita costs, another tenet of the quadruple aim model (*Health.mil*, 2013)
- These improvements will allow FBCH to better align with the broader mission directive of DHA and MHS

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Study Question

How does the implementation of a standardized hand-off tool compare to the current hand-off methods to improve communication between anesthesia providers and PACU nursing staff?

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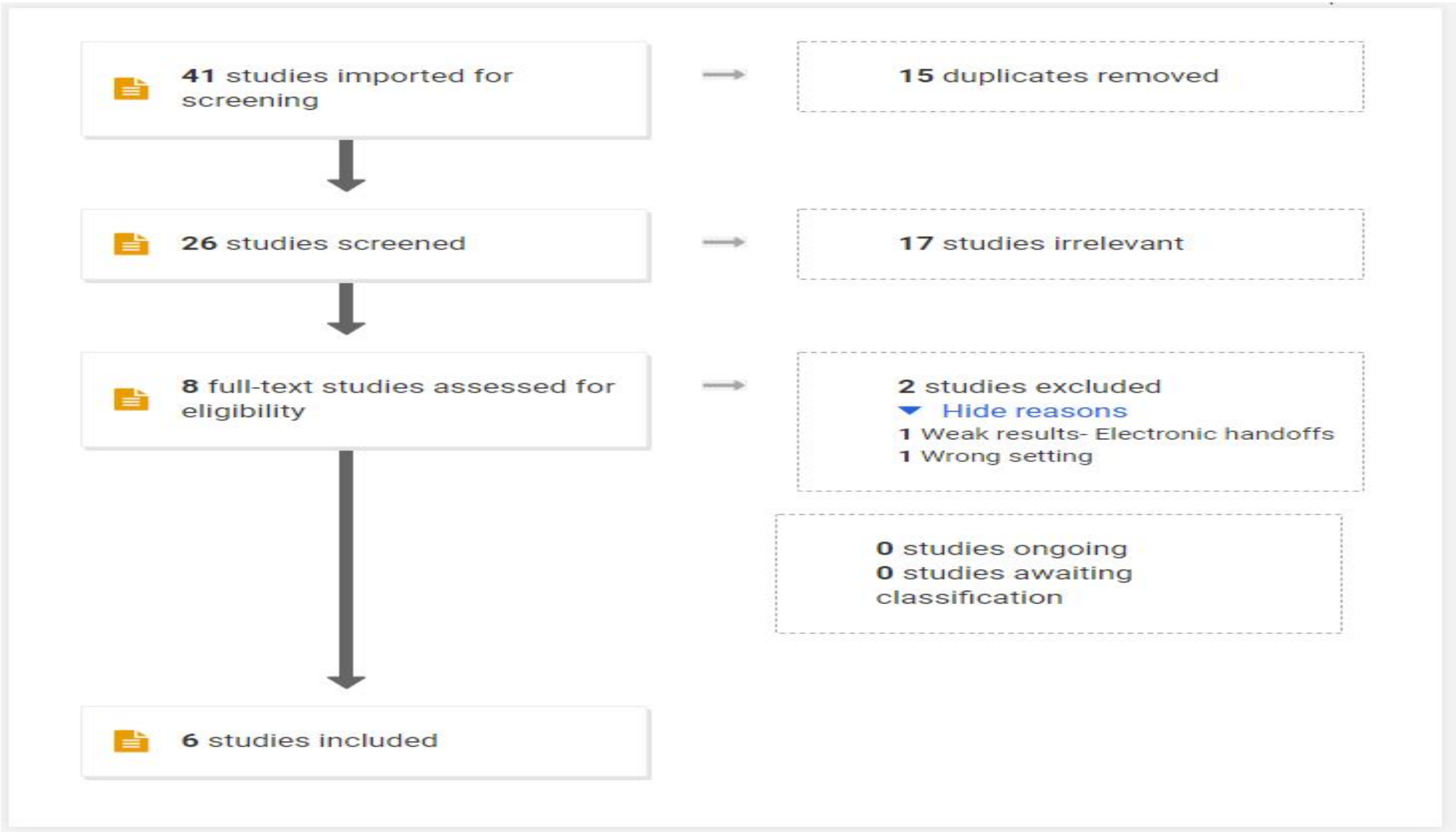
Literature Review of Solution: Search Strategy & Results



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Literature Review of Solution: Solution Synthesis

- 84% of compiled studies indicated standardized checklist improved information transfer during patient handoff when a standardized checklist was the primary variable (*Pucher et al.*, 2015)
  - Eliminates variability of provider communication ability
- Standardized communication tools result in overall reduction in data omission (*Halterman et al.,* 2018)
- 93% of studies utilized a written standardized checklist, while the remaining used electronic
  - Variable electronic charting systems within our environment furthered our need for a written tool
- Reduction in mortality and morbidity when education coupled with communication tool (*Segal et al.,* 2012)

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Business Case Analysis (BCA)

Revenue from cost reduction: • Morbidity and Mortality ($204,000) • Cost of medical treatment ($8,000) (*Medication Errors*, 2019)	$212,000
Cost of implementing project: • Fixed labor costs ($1,280) • Variable costs ($55)	$1,335
Net improvement:	$210,665

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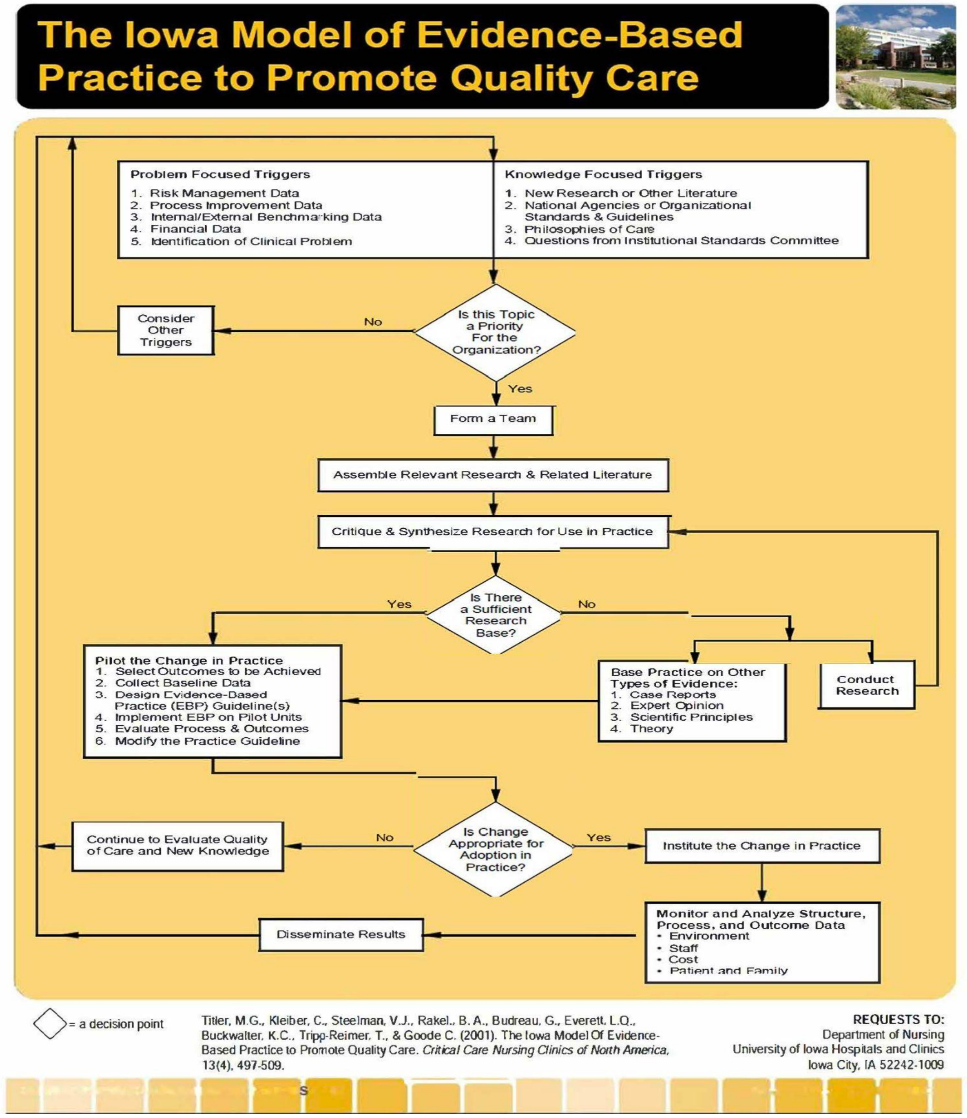
Translation/Organizing Framework



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Organizing Framework

- Iowa Model for Research-Based Practice to Promote Quality Care
- Include Anesthesiologist, Certified Registered Nurse Anesthetist, and Registered Nurses in the PACU
  - 31 Anesthesia providers eligible
  - >50 surgical cases per week
- Potential for adverse medication events in the PACU
  - 2 documented medication errors in the 6 months preceding establishment of this performance improvement initiative

Goals/Phases

- Standardized communication between anesthesia providers and PACU staff
  - Reduction in omission of data
    - Reduction in potential for medication errors
- Data collection
  - 39 pre-implementation and 39 post implementation direct observations of patient-transfer
- Intervention
  - Development of a formalized written tool
    - Approval from anesthesia and PACU department chairs
  - Education of staff
    - Correct utilization and benefit of tool
- Assessment
  - Compliance with use of standardized tool
  - Evaluation of medication errors occurring in a 6 month period post implementation

Project Design: General Approach

- Anesthesia providers and PACU staff, obtaining a minimum of 39 pre-intervention observations
  - Observation focused on if strictly a verbal report was used or a written tool or checklist used
  - Educational intervention
- Complete a minimum of 39 post-intervention observations to evaluate the implementation success of our intervention.
- Comparison of medication errors 6 months pre implementation and 6 months post implementation to determine impact
- 31 anesthesia providers and all PACU RN's in phase 1
- Each anesthesia provider and PACU RN will be observed no more than 5 times in either the pre-intervention or the post-intervention period

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Project Design: Setting and Population

Setting:

- Fort Belvoir Community Hospital, Phase I Post Anesthesia Care Unit

Population:

- <u>Provider</u>: 31 eligible anesthesia providers on staff

- <u>Patient volume</u>: Assumption of >10 surgical cases daily Monday through Friday, we estimated >50 patient per week

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Project Design: Procedural Steps

- Phase 1: Literature review completed, eIRB Approval (01NOV2021)
- Phase 2: Pre-Implementation data collection (02JAN2022)
- Phase 3: Implementation (01MAR2022)
- Phase 4: Post-Implementation data Collection (01MAY2022)
- Phase 5: Data analysis and incidence tracking (02JAN2023)

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Handoff Tool

- DHA Formalized Tool
- IPASS Model

PeriOp IPASS

I/P — ADMIN

☐ Consent

Patient: ______________ Surgeon: ______________ DOS: ________

A — PAU

ALLERGIES: ______________ Orders ☐ YES ☐ NO

T ___.__ °f BP ____/____ P ____ R ____ SpO2 ____% HT ____" WT ____ lb/kg

preOp Date: ________ H&P Date: ________ ☐Dental Clearance ☐ PT will see ANES DOS

LABS & RAD

PAU: ☐BMP/CMP ☐CBC ☐PT/PTT ☐T&S ☐T&S #2 ☐C&S ☐UA ☐CXR ☐ EKG

DOS: ☐BMP/CMP ☐CBC ☐PT/PTT ☐T&S ☐T&S #2 ☐C&S ☐UA ☐CXR ☐ EKG

☐Other ____________ **HCG** ☐NEG ☐POS **FBS** ______mg/dl **COVID** ☐NEG ☐POS

DAY OF SURGERY

T ___.__ °f BP ____/____ P ____ R ____ SpO2 ____% HT ____" WT ____ lb/kg

NPO: __________ **Last Void:** ______ ☐**Contact Precautions** ______________

MEDS IN PHP: ______________________________

ESCORT: CELL: ( ) -

S — PACU/ ANESTHESIA

ANESTHESIA PROVIDER:

MEDS: Fentanyl: ______ Versed: Dilaudid: _____ Propofol: _____ Ketamine: ______

Other: _____ Zofran: ______ Decadron: _____ Toradol: _____ IV Tylenol: ______ Narcan: ______

Input and Output:

Input: LR: ______ NS: ______ HESPAN: ______ Blood Products: ______

Output: EBL: ______ UOP: ______ JP: ______ NGT: ______

Input: LR: _____ NS: _____ HESPAN: _____ Blood Products: _____

Output: EBL: _____ UOP: _____ JP: _____ NGT: _____

S

☐**Isolation Precautions** ____________ ☐**Critical Lab/Xray Needed** ____________

☐ **Blood Product Administered** ____________ ☐**Seizure/Falls Risk** ____________

18 FEB 2022

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Project Design: Data Analysis Plan

- Observations of anesthesia providers and Phase I PACU staff
- Anesthesia provider experience ranged from less than 1 year to more than 40 years of experience
- Conglomerate of Military (Army and Navy), GS, and Contractor staff
- Anesthesiologist and CRNA included in data collection
- Barriers included: Obsolete versions of handoff tool, staff conformity, reporting bias due to researcher staff presence
- Pre and Post intervention data were analyzed using a Chi-Square test performed on STATA version 15 software. A sample size of 39 pre and post evaluation are needed to satisfy an alpha level of 0.05

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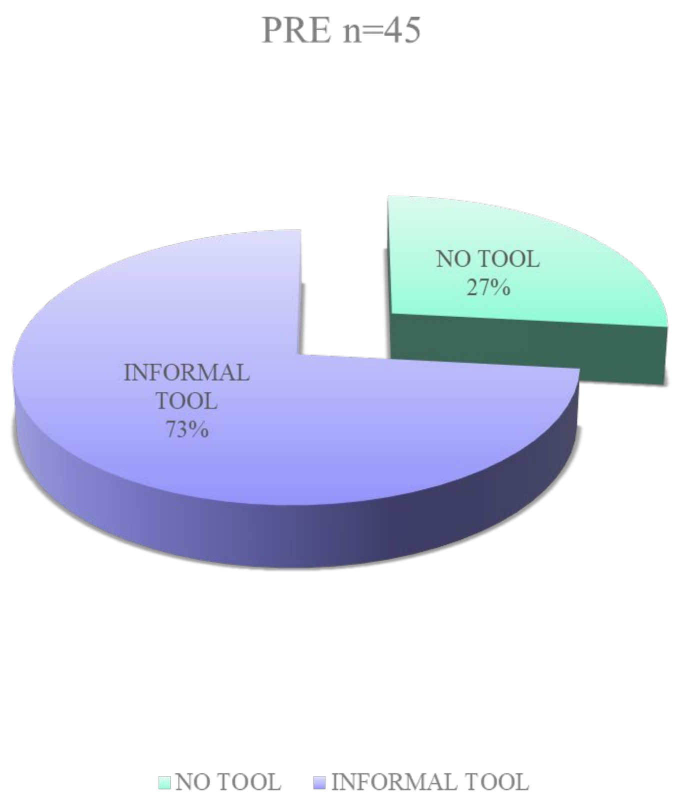
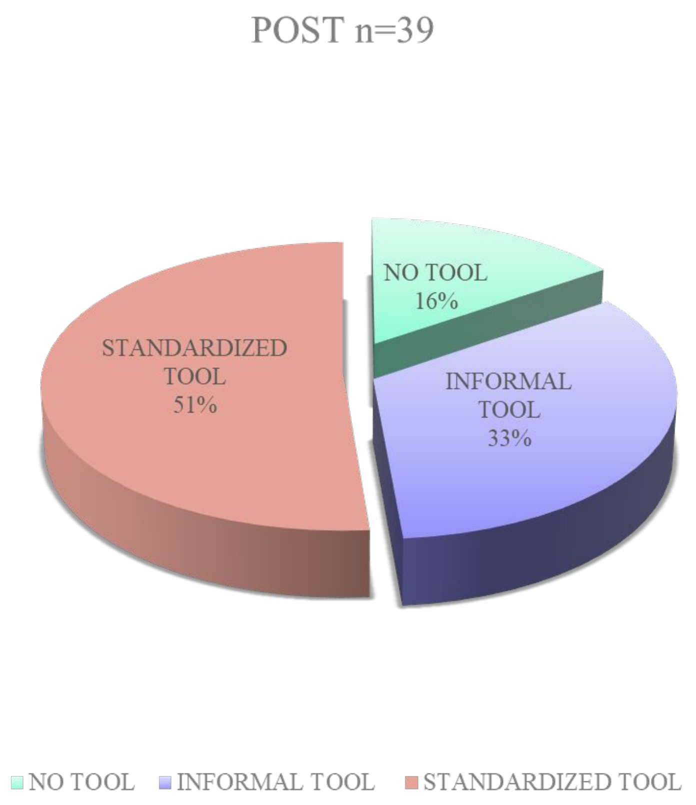
Results

Data collected was categorized into three specific categories both pre and post implementation

- Option A: No Tool Utilized
- Option B: Informal Tool Utilized
- Option C: Formal Tool Utilized

Results





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Results

- Statistically significant **decrease** in “no communication tool”
    - Pre-intervention= 12
    - Post-intervention= 6

- Statistically significant results regarding a **decrease** in “informal communication tool utilization”
    - Pre-intervention= 33
    - Post-intervention= 13

- Statistically significant **increase** in utilization of formal tool
    - Pre-intervention= 0
    - Post-intervention= 20

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Analysis

- Results of PI project showed statistical significance increase in handoff tool utilization

- Clinical significance however is unclear
    - Low (n=2) for medication error
    - Multiple (2) tool utilization: transcription

- Available literature continues to support the positive impact of a standardized handoff tool

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Impact/Implications

- Organizational level:
  - Continuous utilization of a formal standardized communication tool reduces error rates
  - Reevaluate work flow following the full implementation of MHS Genesis

- Audience/patient level
  - Improved compliance utilizing standardized communication tool
  - Increased patient safety
  - Reduced unexpected hospital costs
  - Improved patient experience

Potential Barriers

- Resistance to change
  - Timing of tool availability

- Non-compliance with utilization of a tool

- Lack of understanding regarding the importance of a standardized communication tool

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Project Design: Dissemination Plan

- Facility presentation to the Anesthesia and Surgical departments
- Tri-Service Nursing Research Program (TSNRP) Symposium
- Virtual Teleconferencing (VTC)
- Local presentation opportunities in the Northern Virginia area

Future Directions

- MHS Genesis- integrated perioperative chart allows for PACU RNs to see intraoperative medications administered during report

- Vigilance and continuous evaluation of DHA MTF's is required to ensure efficacious policies and communication practices remain in place

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Conclusion

- Decreased incidence of patient handoffs occurring without a standardized tool decreased 50%

- Statistical significance was obtained however, the clinical significance of this may not translate at FBCH

- Literature clearly shows, utilizing a standardized communication tool during patient hand off reduces incidences of medication errors in the PACU

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