Implementation of a Standardized Handoff Reference Tool from the Intensive Care Unit to the Operating Room

Sophia Agbomah
Stacie Summers

Follow this and additional works at: https://digitalcommons.wustl.edu/dnp_goldfarb
Part of the Nursing Commons
Implementation of a Standardized Handoff Reference Tool from the Intensive Care Unit to the Operating Room

Sophia Agbomah, BSN RN and Stacie Summers, BSN RN

Goldfarb School of Nursing

Barnes-Jewish College

Chair: Dr. Julie Spencer, DNP, RN CDCES

Project Team Member: Dr. Brian Torres, DNP, CRNA

Date of Submission: December 12, 2023
## Table of Contents

Title Page..................................................................................................................................1

Table of Contents.......................................................................................................................2-3

Abstract......................................................................................................................................4

Introduction..................................................................................................................................5

  Background ...............................................................................................................................5

  Problem Statement....................................................................................................................7

  Purpose, Aims & Objectives.................................................................................................8

  PICOT Question.......................................................................................................................8

  Significance.............................................................................................................................8-10

Review of Literature..................................................................................................................10

  Key Concepts.........................................................................................................................11-14

  Patient Population and System Needs..............................................................................14-15

  Evidence for the DNP Project..............................................................................................15

Conceptual Framework..............................................................................................................15-16

Methodology.............................................................................................................................16

  Project Design........................................................................................................................16

    Health Promotion/Disease Prevention..............................................................................17

    Stakeholders.......................................................................................................................18

    Resources...........................................................................................................................18-19

Project Site..................................................................................................................................19

Population..................................................................................................................................19

Recruitment/Sampling Strategy(ies)........................................................................................20

Ethical Considerations...............................................................................................................20
Abstract

Background and Review of Literature: This quality improvement (QI) intervention evaluated the effectiveness of a standardized handoff reference tool for patients transferring from the Surgical Intensive Care Unit (SICU) to the operating room (OR) in a large metropolitan level I trauma center. There was minimal data to assess the quality of this sequence of patient transfer as no systematic ICU-OR handoff content practices were currently employed at the hospital. This project aimed to help fill the practice-knowledge gap that could impact some of the most vulnerable patients during ICU-OR transfer. Methods: Pre- and post-implementation staff surveys, live observations, and chart reviews were utilized to evaluate duration, completeness, clinician knowledge, and attitudes. Handoff observation was used in a non-punitive manner with no reporting other than to gather data for this QI project. Implementation plan and procedure: The intervention focused on education of a novel reference tool developed for this project for all clinicians taking part in handoff, including anesthesia and surgical personnel as those assuming care of the patient, and SICU registered nurses (RNs) and ICU personnel as those who are transferring care. Implications/conclusion: The QI project demonstrated that the standardized reference tool can improve completeness, handoff duration, and clinician satisfaction, while also being cost-effective. Thus, the inclusion of this reference tool is expected to enhance safety, build clinician confidence, and improve effectiveness of ICU to OR handoff.
Implementation of a Standardized Handoff Reference Tool from the Intensive Care Unit to the Operating Room

The Intensive Care Unit (ICU) and the Operating Room (OR) are units where some of the most complex patient care occurs; thus, creating a fluid transition of care provision from one team to the next is imperative. According to the Joint Commission, this scenario is a significant practice-knowledge gap within American hospitals. The Joint Commission addressed this gap in 2006 as a national patient safety goal to improve handoff communication, and in 2010, it became a standard (The Joint Commission, 2017b). This practice-knowledge gap is responsible for devastating statistics regarding patient harm and life loss, delayed patient turnover, clinician malpractice, and institutional revenue losses (Hockman et al., 2017). This project aimed to address this practice-knowledge gap by enhancing effective patient handoff between the Surgical Intensive Care Unit (SICU) and the OR at Barnes-Jewish Hospital (BJH) by identifying and implementing an intervention to close the gap.

Background

The healthcare system has experienced a rapid increase in publications concerning the transfer of care (Caruso et al., 2015; Hockman et al., 2017; Horace, 2021). Quality improvement (QI) efforts that have followed in response to these reports have shown marked mistakes attributed to communication breakdowns during handoffs that have profound patient safety implications (Dekker, 2011). Communication failures in the healthcare system come with a price tag of lives lost and have become a well-known safety concern at the local, national, and international levels.

The Institute of Medicine (2000) published a report called "To Err is Human," which warned of preventable deaths in healthcare settings caused by medical errors, thus prompting
the United States federal government to recommend that healthcare facilities use principles from High-Reliability Organizations (HROs), or organizations with consistently high-quality healthcare outcomes, to decrease medical errors (Sutcliffe et al., 2019). Although the Joint Commission does not publish specific data regarding handoff-related mistakes, they do cite "communication errors," including handoff errors, as contributing causes of sentinel events in hospitals (Caruso et al., 2015, p. 5)

The handoff process between healthcare clinicians is defined as the transfer of care from one clinician to another, ensuring the safe transfer of care between interdisciplinary teams (Patterson, 2015). Handoff within the context of this project was specific to patient transfer from the SICU to the OR at BJH. When patients are transferred from one location of care delivery to another, it is vital to convey crucial and relevant patient information to maintain continuity of care and safety. Communication failures during patient transfers are common and can culminate, resulting in diagnostic and therapeutic delays contributing to adverse outcomes (Hockman et al., 2017).

Transfers of care are considered the norm in healthcare due to the specialization of care across clinicians and various care settings (Trossman, 2019). Irrespective of the mounting evidence that standardized handoffs are beneficial, variability exists, especially from the ICU to the OR. The goals of patient care should be the same across all interdisciplinary teams. Yet, errors frequently arise due to the complex reporting nature and structure, cultural background, stress, fatigue, and time-consuming components (Shahid & Thomas, 2018).

Since the ICU and the OR have some of the hospital's most complex patients, the patient transfer process poses a considerable safety risk. To curb this risk, standardization of patient transfer is a step in the right direction. More specifically, transfers from the ICU to the
OR are complicated because they include providers from many care specialties, crucial timing, and infinite potential distractions, such as rapidly declining patient health (Burden et al., 2021). Omitting even a single piece of information during handoff can result in a chain of events that endangers the patient without the clinician's knowledge (Burden et al., 2021).

The prevailing thought in healthcare nationwide is that professionals lack a standardized handoff checklist for ICU to OR patient transfer (Burden et al., 2021). Even when these checklists are available, they are only sometimes used to their full potential. Consequently, there remains the possibility of missed information and potential errors. Despite the Joint Commission establishing a goal for improving healthcare handoff communication, it remains highly variable. To effectively bridge the gap between theory and practice, it is imperative to inculcate a sense of compliance and consistency and examine possibilities for standardization of communication and barriers to success (Burden et al., 2021).

**Problem Statement**

Lack of standardization in handoff communication was a recurring theme at Barnes-Jewish Hospital during transfers of patients from the ICU to the OR. Handoff failures have resulted in avoidable patient safety events and clinician frustration. This QI project aimed to close this practice-knowledge gap by implementing a standardized reference tool that ensures consistent pertinent patient information is relayed from the ICU clinicians to the anesthesia and surgical clinicians at the time of the transfer of care. The problem in these circumstances often was not due to purposeful error or lack of ability but rather a confounding set of events such as time, reliance on memory, and lack of uniformity to set a proper standard.
Purpose, Aims and Objectives

The project aimed to improve handoff practices using a handoff reference tool to decrease handoff variability in the SICU and to set a new standard to become the norm. The aims of the project were to:

1) Gain knowledge of clinician attitudes through surveys.
2) Develop a new evidence-based handoff reference tool.
3) Observe handoffs before and after handoff reference tool implementation
4) Determine if there was a change in clinician attitude and practice.

The objectives of this project were to decrease handoff duration by 10 percent, increase handoff completeness by 30 percent, and improve staff attitudes towards the handoff process by 40 percent.

PICOT Question

In Surgical ICU and OR anesthesia clinicians (P), does a standardized ICU to OR handoff reference tool (I) compared to current handoff procedures (C) improve completeness and duration of handoff (5 minutes allocated time), and clinician knowledge and attitudes (O) over three months (T)?

Significance

Inadequate communication can lead to critical missed steps and negatively influence patient outcomes, leading to civil penalties such as malpractice and negligence. Judicial proceedings initiated against the institution due to ineffective handoff communication will tarnish the organization's reputation, causing a reduction in the workload received (Johnson & Green, 2021). According to Humphrey et al. (2022), nearly half of the 498 closed malpractice claims examined were attributed to communication errors (47%), including poor
handoff. Consequently, over 30% of malpractice lawsuits and approximately 46% of surgical sentinel events are related to mistakes in handoff (Burden et al., 2021).

The Joint Commission (2017a) estimates that a large teaching hospital - such as Barnes-Jewish Hospital - may have as many as 4,000 daily transfers, with ICU-to-OR transfers accounting for a portion. The critical nature of these patients often includes continuous intravenous infusions, mechanical ventilators, and assistive machines, which hinder these patient populations from communicating for themselves and thus yield a high degree of vulnerability. Burden et al. (2021) report that potential care omissions such as administering blood products, vasopressors, and inserting invasive lines can lay the foundation for a likely safety event. These omissions are often not purposeful and are likely lost or forgotten in the transfer process.

Furthermore, staff accepted variability and substandard handoff results in a dangerous "norm." This has implications for patient safety and has a lesser-known and insidious impact on clinicians. Rodziewicz et al. (2022) outlined that real and perceived errors can lead to feelings of inadequacy, lack of confidence, anger, guilt, and even suicide among clinicians. Additionally, clinicians fear for their well-being, and that reporting can lead to dismissal from their positions (Rodziewicz et al., 2022). Working in an unsafe environment is stressful and emotionally draining for these reasons and has contributed to nurses leaving the profession altogether, adding to the national nursing shortage (Hughes, 2008).

Despite the consequences of a communication error in the healthcare system, the prevailing thought is that clinicians do not utilize handoff checklists when available (Burden et al., 2021). There have been claims that the steps involved in the systematic approach to transfer care are lengthy and cause delays (Humphrey et al., 2022). Evidence indicates that a
checklist does not increase the time required to complete a report (Raeisi et al., 2019) but improves its completeness and accuracy.

Overall, there is not one aspect of healthcare that is not in some way impacted by the failures of the current handoff culture and lack of standardization. Patients feel fear as the statistic of nearly 100,000 deaths is looming (The Joint Commission, 2017b). Financial departments bear the weight as 2 billion is allocated to malpractice when errors occur. The departmental units feel tension amongst interdisciplinary teams as each does not get what they need to provide care. Finally, the staff feels the weight of errors attributed to failed communication practices, as one misstep could cost a life - sometimes even their own. For these reasons, a QI project catered for ICU to OR transfers at BJH was imperative. This QI project aimed to improve handoff practice amongst clinicians by eliminating reliance on memory, improving handoff duration, ensuring completeness, and setting a new BJH standard for ICU to OR handoff practices.

Review of Literature

To address this practice-knowledge gap, key terms such as "safe patient transfers," "patient handoff," "ICU to OR transfer safety," "OR to ICU safe patient transfer," "communication during handoff," "education and patient transfer" and “standardized transfer checklist” was used to search ScienceDirect, PubMed, EBSCO, Quality Improvement Gate, and Google Scholar. The literature search yielded a limited number (four) studies on the topic, which suggests that further research is needed in this area.

The literature review was based on factors influencing patient transfer in medical facilities (hospitals, clinics, and long-term care facilities). The eligibility criteria for the studies were that the studies must be done in the United States and observational. The articles were screened for relevance to the QI topic. The selection was based on the following
inclusion and exclusion criteria: language (English was the only inclusion), date (articles from 2017 to date were included), age (participants aged 18 years and above were included), publications (peer-reviewed articles were included), sample size (greater than 20 were selected), degree of bias, limitations, and evidence level (only level I, II & III studies were included).

Evidence levels are based on research study design. Level I research studies are randomized controlled trials, or systematic review of controlled trials. Level II evidence is of lesser strength compared to level I and includes quasi-experimental studies. Level III evidence includes cohort studies and case-control studies (Glasofer & Townsend, 2020).

Upon general search on the topic, a total of twenty-two articles were retrieved. However, upon critical analysis of the articles, based on inclusion, exclusion criteria, and level of evidence, four articles were determined to be pertinent and applicable to the project, and they were used. From the final selections, the most recurring themes were centered on education and implementation.

**Education** - One of the common themes in the literature was that education is imperative to encourage improved handoff practices. Education is the most prominent intervention tactic for ICU to OR patient transfer, often given in tandem with standardization templates. Horace (2021) and Karamchandani et al. (2018) (both QI projects), utilizing level III evidence, implemented standardized procedures to guide transfers and set expectations going from the ICU to the OR. More specifically, Karamchandani et al. (2018) carried out a cohort study on compliance after proper education; at the end of the 60-day trial, there was a 90.2% overall success rating within one unit (heart and critical vascular units) mastering 100% compliance, and the lowest was 60%. The study showed that 244 patients were transferred with an overall compliance of 95%, with zero safety events related to patient transfer reported. In the post-
intervention phase, 92 team members were surveyed; 85.5% said the checklist relayed pertinent information, 73.9% said it fosters a safe environment, 50% reported cutting unnecessary details, and 74% agreed that the reference list was essential but could use improvements.

Horace (2021) sampled 30 surgical ICU nurses by analyzing the impact of education on using checklists. The QI project yielded level III evidence, and a randomized study design was used. A paired t-test analysis was used to compare pre-test and post-test data - the pre-test identified salient variables that were missed during handoff without any form of education, while the post-test signified variables that were missed after in-service training of the nurses. The mean pre-test was 51.6%, and the post-test was 94.8%; the GraphPad had a p-value of <.001, which implies that it is statistically significant and thus represents a considerable increase in compliance and fewer missed steps with proper education. Horace (2021) utilized a standardized measure called IPASS (Illness severity, Patient summary, Action list, Situation awareness, Synthesis) to effectively enlighten clinicians on the implications and prospects of effective handoff. Though the study relied on clinicians' memory and was heavy on bias selection, it had a larger sample size. It showed significant improvement with less omitted patient information, better patient outcomes (shorter hospital stay), and clinician education satisfaction.

Despite their limitations in surveying small sample sizes and only being implemented in a specific healthcare setting, one unique aspect highlighted by Karamchandani et al. (2018) utilized a memory aid mnemonic. This aid helped staff avoid missing salient steps - TOFSO - Time Out For Sign Out, a universal sign-out tool used for ICU to OR transfers; this helped with efficiency. In addition, the project was successful and implemented across the board for all adult, pediatric, and neonatal ICUs, and there were no safety events during the trial period.
Stenquist et al. (2022), Level II evidence, analyzed pre- and post-intervention following in-service training of appropriate patient handoff. Quality improvement was seen in eight out of nine targeted quality elements. A Poisson regression analysis was used, and strict adherence to the standardized handoff format was sustained at markedly improved levels post-intervention. The regression analysis results suggest that education is vital for adhering to handoff. Though the study was limited in its ability to measure the accuracy of handoff, it indicated that with proper education of clinicians, the use of a handoff reference tool is an adoptable scheme, and that patient safety can be significantly improved.

Caruso et al. (2015) rendered extensive educational resources via presentations, leadership meetings, emails, and visual aids, all geared toward adequate patient readiness. The study sampled a relatively large population of over 300 ICU beds, including different age ranges across the spectrum. However, some significant shortcomings were that the survey excluded surgical procedures performed overnight, emergent cases, and weekend transfers. The study had twenty satisfaction surveys but only paired nine. Thus, it allows room for ambiguity and questions the strength of the evidence. However, the study revealed increased frequency, decreased duration of handoffs, and increased clinician satisfaction. These studies further buttressed the point that education is a salient variable in fostering the adoption and implementation of a handoff reference tool.

**Implementation with standardization** - Implementation practices and findings that prompted intervention were common in standardized handoff literature and QI measures. Karamchandani et al. (2018) and Krimminger et al. (2018) were both QI interventions driven by the recognition of the high-risk nature of these populations. While Karamchandani et al. (2018) focused on ICU to OR transfer direction, Krimminger et al. (2018) emphasized OR to ICU transfer direction. Similar deficiencies such as variability, immense provider
dissatisfaction, lack of consistency, and distraction were critical factors that prompted intervention (Karamchandani et al., 2018; Krimminger et al., 2018). Caruso et al. (2015) highlighted that adverse events occur in up to 70 percent of ICU transports, 30 percent of which occur while transporting to the OR.

Implementation amongst QI studies in Caruso et al. (2015), Karamchandani et al. (2018), and Krimminger et al. (2018) were all carried out in different settings. Caruso et al. (2015) took place in pediatrics with various anesthesia settings and focused on ICU to OR transfers. Karamchandani et al. (2018) took place in a tertiary care center across all ICUs, including adult medical ICU (MICU), surgical anesthesia ICU (SAICU), neuroscience ICU (NSICU), heart and vascular ICU (HVICU), neuro ICU (NICU) and pediatric ICU (PICU) with a focus on OR to ICU transfers. The survey occurred in a busy academic 21-bed adult cardiothoracic ICU (CTICU), emphasizing OR to ICU transfer. Despite the different facilities, populations, and units, standardization of patient transfer was a shared method to achieve systematic handoff. Interestingly, all took different paths to achieve standardization. Caruso et al. (2015) utilized the I-PASS mnemonic, but it does not emphasize which providers should participate, limiting its effectiveness. Karamchandani et al. (2018) employed an institution-based tool that also serves as a mnemonic called TOFSO as a standardized checklist. Still, it is limited because it is specific to this institution. Krimminger et al. (2018) utilized a similar facility-based approach to Karamchandani et al. (2018), called THOR, a mnemonic for "The Handover Report," which was computer-generated document from the patient's electronic health record, but was limited due to connectivity issues.

**Patient Population and System Needs**

The patient population for the project was isolated to SICU patients being transferred to the OR. These patients are critically ill and often unable to speak for themselves,
increasing reliance on clinician communication. Additionally, this patient population is complex and unstable, requiring precise interdepartmental coordination to ensure all parties arrived for handoff promptly.

There was an immense systemic need for a handoff reference tool as each ICU within BJH had its own “norm” where some handoffs were complete, and others were haphazard without structure. This caused significant variability in quality, and anesthesia and surgical clinicians who traveled to all ICUs to receive patients cited it was challenging to know what type of handoff would be received. Additionally, anesthesia and surgical clinicians began to develop their expectations for handoff, confusing ICU nurses as they felt they were either cut short or ill-prepared. The vast variability in expectations interdepartmentally and from a clinician’s standpoint led to safety concerns, frustration, and no standard for the process.

Evidence for the DNP Project

The works of Caruso et al. (2015), Krimminger et al. (2018), and Karamachandi et al. (2018) all showed success through the implementation of standardized handoff formats through different mechanisms such as THOR, IPASS, and TOFSO. This project utilized their success as a platform to develop a standardized handoff reference tool to serve BJH SICU to OR transfers specifically. This QI project was focused on an education-based intervention based on standardized implementation in the literature review.

Conceptual Framework

Adult learning studies exemplify how adults develop, acquire, and use information and abilities. The Adult Learning Theory anchors five fundamental assumptions that occur as an individual seeks to learn: (1) self-concept - the individual's self-concept shifts from an independent personality to a self-direction; (2) adult learner experience - the individual accumulates an increasing reserve of experience that becomes a growing source of learning;
(3) readiness to learn - this becomes based on developmental responsibilities; (4) orientation to learn - a shift in perspective from postponed knowledge application to immediate knowledge application; and (5) motivation to learn is internal (Collins, 2004). The conceptual framework of Adult Learning Theory offers an all-encompassing perspective on adult learning, focusing on the individual learner and the best situation in which they learn. This paradigm incorporates motivation, engagement, assessment factors, and the responsibilities of educators and learners.

Education and implementation are key factors that positively impact adult learning and bring about the desired change. Education equips adult students with the tools and resources to make prudent decisions and gain the necessary skills for success (Kara et al., 2019). Education enables adult learners to obtain the knowledge and self-assurance essential to implement what they have learned and modify their practices. With implementation, learners can collaborate, interact, exchange information, and actively bring to life the acquired skill. The learning dynamic creates an avenue to develop friendships and trust while developing new practices to make a desired change (Collins, 2004). For these reasons, this QI project focused on education and implementation as the keys to success. See Appendix A for a schematic representation of the conceptual framework.

**Methodology**

**Project Design**

The design of this QI project was centered on pre- and post-reference tool implementation; see Appendix B (reference tool). Pre-implementation surveys were sent to all SICU RNs, ICU physicians/APNs, anesthesia clinicians, and surgical representatives via Qualtrics; Appendix C (Survey Tool). Handoffs were observed live via two project members, both pre-and post-implementation in the same manner. Post-implementation surveys were
sent via Qualtrics only to those who participated in an observed handoff after the tool was implemented.

Education of the new handoff reference tool was given via a half-hour in-person staff huddle for SICU RNs and was available to all SICU RNs. Education was also provided via a voice-over PowerPoint, emailed to all SICU RNs, anesthesia clinicians, ICU MD/APNs, and surgical representatives (MDs). The education focused on the importance of a time efficient, complete, and accurate handoff, and emphasized roles as outlined in the Handoff Reference Tool (see Appendix B). Review of this education was available to all for two weeks prior to reference tool implementation. An email reminder to review the PowerPoint was sent to all SICU RNs, anesthesia clinicians, ICU MD/APNs, and surgical representatives (MDs) one month after the education had been emailed. Flyers were posted in anesthesia and SICU common spaces serving as a reminder to staff that the reference tool was implemented, where the tool could be found, and how to reference it.

Health Promotion/Disease Prevention

Improved handoff practices between ICU and OR teams provide a comprehensive view of a patient's medical status to care teams. With the use of the reference tool, aspects of care such as type and screen status, ventilatory settings, and hemodynamic concerns are all addressed so that the anesthesia and surgical teams are privy to the need for lab work, high Positive End Expiratory Pressure (PEEP) requirements, and vasopressor requirements, respectively, that ensure the patient remains safe. Thorough communication and complete handoff procedures can aid in curbing disease progression. For instance, if a high PEEP requirement was not communicated, a patient could experience respiratory decompensation during transport to the OR, resulting in harm or death. The handoff reference tool aimed to
close these potential communication gaps, prevent harm, and promote the continued health and safety of patients.

**Stakeholders**

Key stakeholders in this project were SICU RNs, ICU leadership and educators, anesthesia clinicians and leadership, surgeons, ICU MD/APNs, Goldfarb School of Nursing Project Chairperson, and most importantly, the patients.

**Resources**

This QI project utilized education to improve handoff practices. A half-hour educational information session was conducted during the morning staff huddle for SICU RNs. Twenty SICU RNs attended the meeting, accounting for $700 in employer-paid wages ($35 per hour for each RN). Additional cost accrued from the acquisition of data analysis using the SPSS software was $150. Color-printed and laminated sheets of the reference tool were $100 (see Appendix D).

Additional resources to support this project over 15 weeks within the SICU (4400) unit at BJH were from the Clinical Nurse Specialist of the SICU, who was essential in providing feedback and suggestions, disseminating education, and encouraging staff buy-in. An Assistant Professor at Washington University School of Medicine and attending anesthesiologist provided necessary review and suggestions for the reference tool regarding how it aligned with the current goals and expectations of the anesthesia department. The Assistant Director of the Goldfarb School of Nursing anesthesia program, Associate Professor at GSON, and facility CRNA supported this project by reviewing and guiding the reference tool creation and implementation. The Project Chair and Goldfarb School of Nursing Associate Professor supported this QI initiative with strategic planning, critique, and guidance of the QI initiative's planning, implementation, and data analysis. The Vice Chair
for Health and Systems Liaison and Director of Quality and Safety for Perioperative Services supported this QI project via a letter of support.

**Project Site**

This project took place at Barnes Jewish Hospital (BJH). This facility is a nationally recognized metropolitan level I trauma center housing nearly 3,300 staffed beds (Barnes Jewish Hospital, n.d.; BJC Health Care, n.d.). Barnes Jewish Hospital is a well-renowned facility with a robust academic basis and partnership with Washington University in St. Louis School of Medicine. This foundation created a rich environment for innovation, making it an attractive option for far-away patients for specialized and unique surgeries.

The SICU at Barnes Jewish Hospital was specifically selected for its high frequency of transfers between the ICU and the OR for many surgeries. This unit also had a strong reputation for handoff practices and adopting improvement methods. Upon speaking with key stakeholders, it was deemed that piloting this new tool within the SICU would yield the best adoption and results. This 36-bed unit includes surgical, burn, and trauma patients considered to be critically ill (Washington University School of Medicine in St. Louis, 2023).

**Population**

The population focus of this project focused on the healthcare clinicians responsible for transferring patient care from Surgical ICU clinicians to OR clinicians, which encompasses ICU nurses, ICU physicians and APNs, surgical representatives, and anesthesia clinicians.

This QI initiative focused on adult (18 years old and greater) patients in stable condition (a health condition that is not rapidly declining with patient transfer time being two hours or more to be on the surgical table). This project excluded emergency cases (rapid deterioration of health leading to imminent death, thus requiring the patient to be on the
surgical table within less than one hour). Additionally, Magnetic Resonance Imaging (MRI) transfers and Computerized Tomography (CT) scan transfers were excluded.

**Recruitment/Sampling Strategies**

Recruitment was done on an involuntary basis, as all observations were made innocuously and in a non-punitive manner for QI purposes. Sampling strategies included all transfers meeting inclusion/exclusion criteria, which occurred on observation days within the SICU. A pre-implementation survey and education were sent to all relevant clinicians without exclusion. The post-implementation survey was sent only to clinicians who had participated in the handoff after implementing the new handoff reference tool.

**Ethical Considerations**

The Washington University Department of Anesthesiology Science Garage Research Committee reviewed and approved project plans without ethical or human subject concerns. The committee deemed this project QI without the need for approval from Washington University in St. Louis Institutional Review Board (IRB). Data was kept private and stored in a password-protected computer. Patient information was de-identified to maintain patient confidentiality. Clinician participants were included pre-implementation based on role and post-implementation based on participation in an observed handoff during the time frame of this project.

**Measurement Instruments**

To evaluate the effectiveness and success of the handoff reference tool, the project members delivered pre- and post-implementation surveys electronically via Qualtrics, conducted direct observations of handoffs, and performed thorough EHR chart reviews. The pre-survey was sent via Qualtrics to all SICU RNs, critical care physicians, APRNs, surgical physicians, and anesthesia clinicians. The survey (see Appendix C) inquired about clinician
demographics (age group, gender, years of experience, and specialty) and clinician knowledge and attitudes (views on importance, views on standardization, the familiarity of handoff from ICU to OR, clinician description of the handoff process, if clinicians feel the current process gives them what they needed, views on safety, views on-time effectiveness, and opinions on completeness). Some items within the clinician’s knowledge and attitudes were scored via a Likert scale in which 1 indicated very inefficient and 5 indicated very efficient; some items were scored via the Likert scale in which 1 indicated very poor and 5 indicated very good. See Appendix C. Clinician demographic information was retrieved via survey with gender options being male, female, and other. Age ranges were from 20-70 years in increments of 10 years. Years of experience started at 0-5 years and increased in increments of 5 years to ≥26 years as the final option. Specialties included SICU RN, anesthesia, ICU MD/NP, and surgical team. Content validity was established by a survey review by three academic, anesthesia, and clinical experts. Internal test/retest reliability was established by having three anesthesia and academic experts complete the survey and repeat it one week later and comparing responses for similarity. Clinicians were given two weeks to complete the survey.

Items within the observation tool were a reflection of the handoff reference tool that was later implemented and encompassed the following categories: handoff start time, members present, introductions, patient ID band checked, cultural considerations, critical hook-up, allergies, isolation, code status, lines, drains, IV access, continuous intravenous infusions, antibiotic coverage, hemodynamic changes, MAP goals, type & screen status, baseline assessment findings, recent lab results, Epic checklist completed, brief Review of Systems (ROS), surgical and blood consent, SICU RN most pertinent concern, planned
procedure, planned antibiotic coverage for the procedure, anesthesia plan, and handoff stop
time (see Appendix E).

Each observer used the observation tool independently and, after handoff, compared
to achieve consensus and establish inter-rater reliability. To establish validity post-handoff,
each project member performed a thorough, independent chart review to compare the
completed observation tool to patient information in the chart, reflecting a percentage of
handoff completeness. To ensure accuracy, each chart review was compared to achieve
consensus between observers. This chart review data was collected on an Excel spreadsheet.

The start time to calculate handoff duration was anesthesia arrival time. The trigger to
end handoff time was the patient leaving the room. The same smartphones recorded start and
end times in whole minutes with times being rounded up or down based on clock-timing. For
example, if handoff started at 10:48 and 10 seconds and ended at 10:52 and 20 seconds, this
would count as a total time of 4 minutes. It was done in this manner as the 5-minute goal
allocated for handoff to ensure OR turnover times will be read in the same way.

**Data Collection Procedure**

Pre-implementation surveys were emailed to all SICU RNs, anesthesia clinicians, ICU
clinicians, and surgical representatives via organizational email addresses—the electronic
version aimed to allow for ease and increase the response rate. Live observations occurred
pre- and post-implementation primarily on Tuesdays from 7:00 a.m. to 3:00 p.m. but also
included one Monday from 7:00 a.m. to 12 p.m. post-implementation. Only handoffs deemed
non-emergent and occurring from the SICU to the OR were observed. Observations were
performed from the student role to decrease the Hawthorne effect and yield more genuine
clinician performance. Two observers were present at each handoff. Each observer
independently measured handoff duration and used the observation tool to measure the
degree of handoff completeness. Information on the observation tool was checked as "yes" if it was relayed in handoff or as "no" if omitted or deemed incomplete. Any item marked "no" on the observation tool was eliminated if that information did not apply to the patient as confirmed in the EHR and, therefore, did not count in the percentage of completeness. After the education and once the reference tool had been implemented in the unit for two weeks, live observations were made utilizing the same measurement methods, criteria, and sequence. Post-implementation surveys were emailed only to those who participated in an observed handoff after implementing the reference tool.

**Data Analysis**

This project presented descriptive and inferential statistics on its data. Clinician demographic nominal data were described using percentages, and independent groups were compared using chi-square tests. Clinician knowledge and attitudes from the surveys were analyzed via the Mann-Whitney test for ordinal data. Handoff duration and completeness interval data were described using measures of central tendency and analyzed using independent samples t-test and Cohen's d. Completeness based on observations and chart reviews was a percentage for each patient, reported as a mean for pre- and post-implementation. Statistical Packages for Social Sciences (SPSS) version IBM SPSS 29 was used for data analysis, and the alpha was set at .05, with a p-value < .05 representing statistical significance.

**Procedures for Project Implementation**

Cultural diversity and religious consideration were respected. This QI initiative accommodated all cultures, norms, and values by allocating time within handoff to address such topics to ensure all clinicians know patients' requirements for culturally competent and respectful care. This practice extended to inclusivity in gender classification to accommodate
the variability and uniqueness in gender classification and adherence to preferred pronouns. The principles of ethical consideration, such as anonymity, confidentiality, and communication, were firmly adhered to.

During the implementation of this project, input was sought from key stakeholders on the current handoff process, barriers to the success of the project, and ways to foster buy-in of the reference tool. The survey tool was built to capture clinician demographics and attitudes. The reference handoff tool was created with inputs from evidence in the literature and ICU, Anesthesia, and GSON stakeholder feedback and testing with a goal of five minutes for handoff duration; the chart review process was followed sequentially via the patient’s EHR for every handoff. Education development was finalized after analysis of pre-implementation survey feedback. Reminder flyers were disseminated after the educational presentation to increase the adoption of the reference tool.

**Outcomes and Evaluation**

**Results**

The pre-implementation survey sample (n = 33) was predominantly female (n = 19, 57.4%), 31-40 years of age (n = 17, 51.5%) with 0-5 years of experience (n = 16, 48.5%), and in the anesthesia specialty (n = 27, 81.8%). The post-implementation survey sample (n = 14) was an equal number of males and females (n = 7, 50%), predominantly 41-50 years of age (n = 7, 50%) with 0-5 years of experience (n = 6, 42.9%), and an equal number of predominantly surgical representatives and ICU RNs (n = 5, 35.7%). Chi-square comparison of demographic variables revealed no statistically significant differences between pre- and post-implementation independent groups (p > .05) except for the specialty variable (p < .001) (see Appendix F, Table F1).

Mean pre-implementation handoff duration was 8 minutes (n = 6, range 5-11 minutes, \( Mdn = 9 \) minutes, \( \sigma = 2.8 \)) and mean post-implementation duration was 9 minutes (n = 8, \( Mdn = 9 \) minutes, \( \sigma = 2.8 \)).
range 5-17 minutes, $Mdn= 7$ minutes, $\sigma = 4.3$) (See Figure F1). Mean pre-implementation completeness of handoff was 32% ($n = 6$, range 16% - 48%) and mean post-implementation completeness was 77% ($n = 8$, range 33.3% - 88%) (See Figure F2).

Pre- and post-implementation data based on clinician knowledge and attitudes was averaged and analyzed via the Mann-Whitney U test (See Appendix F, Table F2). Next, the mean score was derived for both pre and post implementation; Pre-implementation ($n = 33$), the mean response for description of current handoff practices (Q8) was 3.0, the mean score inquiring about time efficiency of current practices (Q11) was 3.06, and the mean score was 3.03 for clinician satisfaction with current handoff practices (Q14). Post implementation ($n = 14$), the mean score for Q8 was 3.93, the mean for Q11 was 4.0 and Q14 had a mean score of 4.36 (see Appendix F, Table F2). There was a statistically significant difference between pre- and post-implementation data of respondents being able to better describe the handoff process, better equipped to care for patients, safer handoff process, improved time efficiency and completeness, and overall level of satisfaction ($p < .05$). However, there was no statistical significance between pre- and post-implementation data on how respondents perceived the importance of effective communication as well as a handoff standardization and clinician familiarity with the handoff process ($p > .05$).

**Discussion of Findings/Outcomes**

Overall, the findings indicate that it is possible to improve completeness, duration, and satisfaction through use of a standardized hand-off reference tool. The purpose of this project was to improve handoff practices and decrease variability. This was achieved as evidenced by overall completeness scores improving during post-implementation phase, and improved completeness thereby translates to decreased variability as all observations were scored based on items of the handoff reference tool. The aims of the project were to gain
clinician attitudes through surveying, develop a new handoff reference tool, observe handoffs between and after tool implementation, and to determine if there was a change in clinician attitude and practice. All aims were met through the course of this project. The objectives of this QI project were to decrease handoff duration by 10 percent, increase handoff completeness by 30 percent, and improve staff attitudes towards handoff process by 40 percent. The handoff duration objective was not met (-12% improvement) as one outlier handoff required 17 minutes (week 1 post-implementation, See Figure F1). However, as shown in Figure F1, over time, post-implementation handoff duration improved weekly and reached a mean duration of 6.2 minutes after removing the outlier ($n = 7$), which does show a mean 1.8 minutes (23%) improvement when compared with pre-implementation. Although the handoff duration goal was not technically met due to the outlier, completeness did improve. The handoff completeness objective was met by an improvement of nearly 44% (comparing means of pre-implementation observations and post-implementation observations, see Figure F2). The objective to improve clinician attitudes towards the handoff process was also met as evidenced by Q14 with overall satisfaction improving from a mean of 3.03 on the Likert scale to an average of 4.36, representing a near 44% increase (See Table F2 and F3).

**Strengths and Limitations of Findings**

There were many strengths in the culmination of this data. There was a good array of role representation through the surveys (See Table F1) and pre and post surveys had homogenous groups, except there was no correspondence from ICU RNs in the pre-survey. Furthermore, the same two observers independently observed and scored each handoff improving inter-rater reliability. Each item from each observation was discussed and agreed upon from each observer in addition to utilizing the EHR to verify items. Handoff duration
was measured consistently by rounding to the minute, utilizing a standard electronic phone, and standardizing the start time and stop time for each observed handoff.

Though there were many strengths in this data, there were also some limitations. First, the sample size was a limitation especially because it was a small cross-section of overall transfers that happened within this unit. Furthermore, there was a variation between pre-implementation and post implementation sample sizes; post-implementation sample sizes were smaller since it included only clinicians that took part in the handoff process. Additionally, of the transfers that were observed, the Hawthorne effect likely was present. An additional limitation to this data was that it occurred only in one unit of a single facility. Finally, the last two weeks of post-observation clinicians were not given the survey as the additional observations were only to assess short-term sustainability.

**Evaluation of the Process**

The Adult Learning Theory that was utilized in the framework of this education focused on self-concept, adult learner experience, readiness, orientation, and motivation to learn (Collins, 2004). Adult learners for this QI project had a chance for individual learning as all education was sent directly via email, could be read, or listened to and was given live. This method proved effective as learning was achieved, supported by statistical results as well as satisfaction surveys, which ultimately helped to meet overall purpose, aims and goals for this project.

There were several things within the course of this project that worked well, and some that could have been improved. Communication and collaboration were key in this project as it spanned across many specialty areas which depended on key stakeholders’ input to proceed to the next stage. The handoff reference tool was a benefit for staff comparable to a checklist as the connotation of a checklist often entails an attitude of an additional task for staff. A goal
of the reference tool was to improve the process while also not being seen as another task burden for staff, which worked well for this project.

In retrospect, it could have been improved if more stakeholders and representation could have been involved. More input from anesthesia team members about what they deem as important and input from SICU RNs regarding potential barriers could have enriched the process for both parties. The project time frame made communication and collaboration difficult in some regard because there were specific tasks with deadlines that could not be completed without the necessary approval from stakeholders.

A large barrier throughout this QI project was communication between team members and some stakeholders; this lag in communication was because of personal and professional commitments of stakeholders. This resulted in a one-month delay for education disbursement to the ICU, RN, and surgical stakeholders and ultimately pushed the project timeline out significantly. This also implicated some unexpected additions of flyers and reminder emails being sent at the start of the “Go-live” date, and the start of post-implementation observations. Including more team members with overlapping capabilities, such as having subordinates to ICU stakeholders, would have been beneficial and could have streamlined both the process and potential for increased buy-in. Additionally, this project spanned over four specialties which required coordination and cooperation from many different parties. Finally, the last two weeks of post-observation clinicians were not given the survey as the additional observations were only for sustainability purposes.

Although not a barrier, this project had to work in collaboration with other current facility projects that held implications in OR turnover times which was relevant to our project as handoff occurs during this time allocation. This required strong communication and collaboration with members from the other project (Improving ICU-OR and OR-ICU
turnover time by Dr. Rashmi Rathor) which in fact, helped to set some framework for this QI project and could ultimately complement and foster the success of both projects. Overall, this was a cost-effective project that improved patient safety when transferring critical patients.

**System and Practice Impact**

**Implications for Organizational and Systems Change**

This QI initiative provides a starting point to improving the ICU-OR patient handoff process. This project has demonstrated that completeness in the handoff process can be achieved, likely with more practice and familiarity, within the allocated time frame (5 minutes). A successful improvement was seen two weeks after post implementation observations, which signifies that there is a potential for organizational change to move this initiative to the next step.

It is proposed that this initiative be spread to other ICUs within BJH. For other ICUs to benefit from this initiative and implement their respective handoff policy, the reference tool needs to be specifically tailored to the needs of the respective ICU. Items on the reference tool that are not applicable may be replaced with needs of the specific unit. Nursing leaders within the system can be solicited by project members at a Critical Care Committee meeting to spearhead this hospital-wide system change initiative, mentor new nurses on best practices, and educate seasoned nurses on the need for a system change. Once established as an effective change and with the collaborative effort of all stakeholders, BJH could encourage other hospitals to adopt this standardized ICU-OR handoff practice.

**Recommendations for Nursing Practice**

Based on this project, it has been established that nursing practice can be improved by initiating a standardized handoff reference tool and thus maximizing patient safety and minimizing patient risk while transferring from one specialty to another. However, to get to
this point, nursing staff from all ICUs and anesthesia providers will not only have to adopt the implementation, but also accept it as a new normal and anything that varies from this as being substandard.

Another recommendation is to create a platform for recognition to support change. As this project is adding a task to many staff members, positive recognition can go a long way in terms of buy-in and success long term. Positive performance results should continue to be obtained and relayed to staff as something to be celebrated. Since the successful pilot in the SICU, the next step would be to disseminate the reference handoff tool to all other ICUs. This can be achieved by key nursing leaders providing education on the tool, benefits of using it, and expectations of how this tool will work. Once all ICUs have received education, handoff reference tool templates can be laminated and placed in each ICU room for immediate use. Applying this tool to all ICUs in a uniform manner will also be a key strategy in success as this will impact not only the individual units, but also the anesthesia providers that receive patients from all ICUs. This will ultimately be the step to set a new norm and reduce variability.

Sustainability

The long-term sustainability of this project will greatly depend on fostering unit champions (both the handoff and receiving clinicians) that will continually reinforce the need for comprehensive ICU-OR handoff via the use of the reference tool. In addition, performance results should be communicated with the ICU team during morning rounds, weekly reminders, and monthly unit meetings. It is anticipated that these reminders will continuously refresh everyone’s mind on the goal at hand. While it is important to motivate the team on achieving handoff goals, it is paramount to create an environment to celebrate
improvement in the handoff process by rewarding the team with a star badge, refreshment, and/or publishing achievements in the unit bulletin/magazine.

The overall goal of this QI project is for this initiative to spread to other ICUs within BJH. To achieve this, there needs to be effective communication and collaboration among all ICUs, champions from the surgical ICU (4400 ICU), and likeminded nurses to spearhead this initiative in their respective ICUs. Other ICUs will need to tailor the reference tool to fit their specific needs and make it as user friendly as possible. Finally, to address continuity in support, and to ensure the momentum continues, the project members will periodically check in with the champions in 4400 ICU to render support, assess areas for improvement, and hopefully celebrate their wins. This information can aid in further success and improvement in the process, while also hearing staff input. If, at this point, the tool is not being used, it is a good time to reevaluate why it is not being utilized and make improvements so progress and momentum is not lost. Reeducation, positive reinforcement, and reiteration of expectations are all ways to continue the momentum and hopefully achieve hospital-wide success and, over time, set the goal of a new norm for ICU-OR handoff practices.

Summary and Conclusion

Project Summary

Barnes-Jewish Hospital faces a practice-knowledge gap in handoff communication during patient transfers from ICU to OR. Implementing a standardized reference tool is crucial to ensure accurate and complete patient information is relayed. This QI project yielded desirable results and proved to be a good starting point for improved handoff practices and closing the practice-knowledge gap of ICU to OR transfers. The project’s implementation was guided by evidence-based initiatives, demonstrating the potential of handoff standardization to enhance clinician confidence and improve safety via education and
the use of a reference tool. The QI project revealed that a reference tool can enhance completeness, duration, and clinician satisfaction and most importantly, it is cost effective. The QI project is anticipated to spread to other ICUs within BJH, potentially leading to a state-wide policy on ICU-OR patient handoff, thereby standardizing the process and reducing missed steps and errors.

**Plan for Dissemination**

The DNP Project dissemination strategy includes a PowerPoint presentation that outlines the project's objectives, design, execution, as well as evaluation components. In the early weeks of December 2023, a Microsoft Teams meeting was conducted to deliver a PowerPoint oral presentation to all GSON faculty, staff, and students, and all relevant project stakeholders. The results of the QI project will be shared with the Critical Care Committee to facilitate BJH ICU-wide implementation. A project poster will be presented at the 2024 GSON Spring Research Day.
References

Barnes Jewish Hospital. (n.d.). The level I difference. https://www.barnesjewish.org/Medical-Services/Trauma-Acute-Care-Surgery/Level-I-Trauma-Center/The-Level-I-Difference


Appendix A

Conceptual Framework - Adult Learning Theory

## Appendix B

### Handoff Reference Tool

<table>
<thead>
<tr>
<th>OR Start Times</th>
<th>Handoff Reference Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mondays Pod 3 (Late Start)</td>
<td>First Start: 0830</td>
</tr>
<tr>
<td>Wednesdays All Pods (Late Start)</td>
<td>First Start: 0830</td>
</tr>
<tr>
<td>All Other Days Normal Start</td>
<td>First Start: 0730</td>
</tr>
<tr>
<td><em>There is no call on first cases</em></td>
<td></td>
</tr>
</tbody>
</table>

| Prior to meeting: | • OR team will call ICU Charge RN with time that the team will arrive to transport patient to OR  |
|                  | • ICU charge RN will notify ICU team with time  |
|                  | • Team will assemble at the bedside at that time  |

| Handoff start: | • Patient ID is verified with armband, allergies, code status and isolation status  |
|                | • Critical considerations (language, preferred pronouns etc.)  |
|                | • Critical hook up: A-line, NIPB, SpO2, ECG, chest tube or ventriculostomy, and simultaneously Vent and EtCO2  |
|                | • Introductions of personnel required for handoff  |
|                | - Anesthesia provider, ICU RN, ICU provider, and surgeon representative  |

| ICU RN | • Checklist completed  |
|        | • IV Access, drips and drains reviewed  |
|        | • Antibiotic regimen & last dose  |
|        | • Brief ROS  |
|        | • Ventilator settings  |
|        | • Labs – T&S status  |
|        | • Hemodynamic changes & MAP goals  |
|        | • Surgical and blood consent confirmed  |
|        | • The thing I am most concerned about this patient is  |

| Surgical representative | • Planned surgery.  |
|                         | • Planned antibiotics desired  |

| Anesthesia representative | • Plan for anesthesia  |

| Whole team | • Any questions or clarifications?  |
Appendix C

ICU to OR Handoff Survey Tool

**Clinician Demographics**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Male</th>
<th>Female</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age range</td>
<td>20-30yrs</td>
<td>31-40yrs</td>
<td>41-50yrs</td>
</tr>
<tr>
<td>Years of experience</td>
<td>0-5yrs</td>
<td>6-10 yrs</td>
<td>11-15 yrs</td>
</tr>
</tbody>
</table>

Specialty ICU RN (Specify unit) Anesthesia Provider  ICU MD/NP Surgical Resident/surgical Fellow

**Clinician Knowledge & Attitude**

- How important is effective ICU to OR handoff communication to you?
  
  1- Not at all important  2- Low importance  3- Neutral  4- Important  5- Very important

- How important is a standardized process for ICU to OR transfer?

  1- Not at all important  2- Low importance  3- Neutral  4- Important  5- Very important

- How familiar are you with the current handoff process for ICU to OR transfer?

  1- Not at all familiar  2- Not so familiar  3- Somewhat familiar  4- Familiar  5- Very familiar

- How would you describe the current ICU to OR handoff process?

  1- Very poor  2- Poor  3- Acceptable  4- Good  5- Very good

- Does the current ICU to OR handoff process give you the tools to care for the patient?

  1- Strongly disagree  2- Disagree  3- Neither agree or disagree  4- Agree  5- Strongly agree

- How safe is the current ICU to OR handoff process?

  1- Very unsafe  2- Unsafe  3- Somewhat safe  4- Safe  5- Very safe

- How time efficient is the current ICU to OR handoff process?

  1- Very inefficient  2- Inefficient  3- Somewhat Efficient  4- Efficient  5- Very Efficient
• How complete is the current ICU to OR handoff process?
  1- Very incomplete 2- Incomplete 3- Somewhat complete  4- Complete    5- Very complete

• Does the current ICU to OR handoff process need improvement?
  1- Strongly disagree 2- Disagree 3- Neither agree or disagree  4- Agree    5- Strongly agree

• How satisfied are you with the current ICU to OR handoff process?
  1- Very dissatisfied  2- Dissatisfied  3- Neither dissatisfied nor dissatisfied  4- Satisfied    5- Very satisfied

Comments (free text)
Appendix D

Cost and Benefit Analysis/Budget

<table>
<thead>
<tr>
<th>Cost Variable</th>
<th>Amount</th>
<th>Benefit</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>One hour education session</td>
<td>20 clinicians at the rate of $35/hour $700</td>
<td>Lives saved from critical missed steps (Eyibio &amp; Daniel, 2020)</td>
<td>~ $100,000</td>
</tr>
<tr>
<td>SPSS Data Analysis</td>
<td>$150</td>
<td>Reduction in lawsuits and liability (Satiani, 2004)</td>
<td>~ $300,000</td>
</tr>
<tr>
<td>Colored printed and laminated sheets of the reference tool</td>
<td>$100</td>
<td>Increased turnover time, reduced hospital stay and hospital acquired infection (Hollingsworth, 2008)</td>
<td>~ $200,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$950</strong></td>
<td><strong>Total</strong></td>
<td><strong>$600,000</strong></td>
</tr>
<tr>
<td><strong>Net Benefit</strong></td>
<td></td>
<td></td>
<td><strong>$599,050</strong></td>
</tr>
</tbody>
</table>

Appendix E

Handoff Observation Tool

<table>
<thead>
<tr>
<th>Item</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All members present</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Introductions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient ID band checked</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cultural considerations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Critical hook up (all components)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Checklist completed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allergies discussed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolation status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Code status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drains</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV access</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuous intravenous infusions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antibiotics &amp; regimen (last dose)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline assessment findings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brief ROS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hemodynamic changes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAP goals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ventilator settings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recent lab results</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type &amp; Screen status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surgical and blood consent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Addressed most pertinent concern</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planned procedure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antibiotics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anesthesia Plan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time for questions/clarifications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>End time</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix F

Outcomes Tables/ Figures

Table F1

Descriptive Demographics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Pre-Implementation</th>
<th>Post-Implementation</th>
<th>Chi-Square</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>13</td>
<td>39.4</td>
<td>7</td>
<td>50</td>
</tr>
<tr>
<td>Female</td>
<td>19</td>
<td>57.4</td>
<td>6</td>
<td>42.9</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>3.0</td>
<td>1</td>
<td>7.1</td>
</tr>
<tr>
<td><strong>Age Range (years)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-30</td>
<td>3</td>
<td>9.1</td>
<td>1</td>
<td>7.1</td>
</tr>
<tr>
<td>31-40</td>
<td>17</td>
<td>51.5</td>
<td>6</td>
<td>42.9</td>
</tr>
<tr>
<td>41-50</td>
<td>7</td>
<td>21.2</td>
<td>7</td>
<td>50</td>
</tr>
<tr>
<td>51-60</td>
<td>2</td>
<td>6.1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>&gt;60</td>
<td>4</td>
<td>12.1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Experience (years)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-5</td>
<td>16</td>
<td>48.5</td>
<td>6</td>
<td>42.9</td>
</tr>
<tr>
<td>6-10</td>
<td>8</td>
<td>24.2</td>
<td>5</td>
<td>35.7</td>
</tr>
<tr>
<td>11-15</td>
<td>2</td>
<td>6.1</td>
<td>3</td>
<td>21.4</td>
</tr>
<tr>
<td>&gt;15</td>
<td>7</td>
<td>21.2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Specialty</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anesthesia Provider</td>
<td>27</td>
<td>81.8</td>
<td>3</td>
<td>21.4</td>
</tr>
<tr>
<td>ICU MD/NP</td>
<td>3</td>
<td>9.1</td>
<td>1</td>
<td>7.1</td>
</tr>
<tr>
<td>Surgical Representative</td>
<td>2</td>
<td>6.1</td>
<td>5</td>
<td>35.7</td>
</tr>
<tr>
<td>OR RN</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ICU RN</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>35.7</td>
</tr>
<tr>
<td>No Entry</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Note. ICU – Intensive Care Unit, MD – Doctor of Medicine, NP – Nurse Practitioner, OR – Operating Room*
**Figure F1**

*Change in Handoff Duration Over Time*

Note: Pre-implementation median (Mdn) and standard deviation (σ) was 9 and 2.8 respectively while post-implementation Mdn and σ was 7 and 4.3 respectively.

**Figure F2**

*Change in Handoff Completeness Over Time*
Table F2

Handoff Perceptions

<table>
<thead>
<tr>
<th>Survey Question</th>
<th>Pre-implementation</th>
<th>Post-Implementation</th>
<th>Mann-Whitney U</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>M</td>
<td>N</td>
<td>m</td>
</tr>
<tr>
<td>Q5</td>
<td>33</td>
<td>4.52</td>
<td>14</td>
<td>4.29</td>
</tr>
<tr>
<td>Q6</td>
<td>33</td>
<td>4.18</td>
<td>14</td>
<td>4.14</td>
</tr>
<tr>
<td>Q7</td>
<td>33</td>
<td>3.88</td>
<td>14</td>
<td>4.07</td>
</tr>
<tr>
<td>Q8</td>
<td>33</td>
<td>3.00</td>
<td>14</td>
<td>3.93</td>
</tr>
<tr>
<td>Q9</td>
<td>33</td>
<td>3.36</td>
<td>14</td>
<td>4.14</td>
</tr>
<tr>
<td>Q10</td>
<td>33</td>
<td>3.36</td>
<td>14</td>
<td>4.14</td>
</tr>
<tr>
<td>Q11</td>
<td>33</td>
<td>3.06</td>
<td>14</td>
<td>4.00</td>
</tr>
<tr>
<td>Q12</td>
<td>33</td>
<td>3.21</td>
<td>14</td>
<td>4.07</td>
</tr>
<tr>
<td>Q13</td>
<td>33</td>
<td>3.85</td>
<td>14</td>
<td>2.14</td>
</tr>
<tr>
<td>Q14</td>
<td>33</td>
<td>3.03</td>
<td>14</td>
<td>4.36</td>
</tr>
</tbody>
</table>

Note. Q5 – How important is effective handoff communication to you? Q6 – How important is a standardized process for ICU to OR transfer? Q7 – How familiar are you with the current handoff process for ICU to OR transfer? Q8 – How would you describe the current ICU to OR handoff process? Q9 – Does the current ICU to OR handoff process give you the tools to care for the patient? Q10 – How safe is the current ICU to OR handoff process? Q11 – How time efficient is the current ICU to OR handoff process? Q12 – How complete is the current ICU to OR handoff process? Q13 – Does the current ICU to OR handoff process need improvement? Q14 – How satisfied are you with the current ICU to OR handoff process?

Table F3

Proposed and Final Objectives

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Proposed</th>
<th>Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decrease handoff duration (with post-implementation outlier)</td>
<td>10%</td>
<td>-12%</td>
</tr>
<tr>
<td>Decrease handoff duration (without post implementation outlier)</td>
<td>10%</td>
<td>23%</td>
</tr>
<tr>
<td>Increase handoff completeness</td>
<td>30%</td>
<td>44%</td>
</tr>
<tr>
<td>Improve clinician satisfaction with current handoff practice</td>
<td>40%</td>
<td>44%</td>
</tr>
</tbody>
</table>