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A Needs Assessment for the Development of the TIME Anesthesia Handoff Tool

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A Needs Assessment for the Development of the TIME Anesthesia Handoff Tool

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Abstract

Background: Despite a growing awareness that a standardized handoff tool is critical to providing safe and effective patient care, there are limited studies to assess the need for the development of such tools for anesthesia providers.

Objectives: The purpose of this descriptive survey study was 1) to assess the need for a standardized handoff tool for anesthesia providers and 2) to identify the most essential components to develop an anesthesia handoff tool.

Methods: A descriptive survey research design was utilized.

Results: Of 82 responses, 53 (64%) reported that they did not currently use a systematic process during transfer of care for anesthesia. Most (73%) felt they were given inadequate information however, forty (48.8%) rarely gave inadequate information. Forty (48.8%) sometimes discovered something that wasn't discussed. The most frequently provided components were airway type, airway difficulty, analgesia, anesthetic type, invasive lines, patient medical history, procedure, and vital signs. The most frequently received were airway difficulty, invasive lines, medical history, and procedure. The most essential components were airway type, airway difficulty, allergies, anesthetic type, invasive lines, patient medical history, procedure, and vital signs.

Conclusions: Most participants perceive that anesthesia providers currently provide inadequate handoff. The most essential components to include in anesthesia handoff are airway difficulty, invasive lines, medical history, procedure/case-specific concerns, allergies, medications and plan/goals.

Relevance to Clinical Practice: The findings of this study guide the proposal of a new anesthesia handoff tool named TIME (transaction, induction, maintenance, emergence) as a concise, efficient tool. This tool will create an efficient method to organize the important

components of handoff during transfer of between anesthesia providers, resulting in improving patient care.

Chapter 1. Introduction

Background and Significance of the Problem

In January 2006, the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) developed a national patient safety goal regarding patient hand-offs (JCAHO, 2007). It is estimated that 80% of serious medical errors involve miscommunication between caregivers during the transfer of patients (JCAHO, 2012). Since 2012, human factors and communication have been rated in the top three of most frequently identified root causes of sentinel events (JCAHO, 2015). The Institute of Medicine (2001) also reported, “it is in inadequate handoff communication that safety often fails first” (p. 45).

The Joint Commission Center for Transforming Healthcare reported many problems such as delayed or inappropriate treatment, adverse events, increased length of hospital stay and increased costs are the result of ineffective handoffs (JCAHO, 2009). In addition, JCAHO (2015) reported communication errors as the primary cause of unexpected events involving patient death or serious physical injury. These negative consequences of poor handoff communication stress the importance of quality handoff communication. The handoff quality depends upon the dynamics of the situation such as who is communicating what information to whom and what necessary information is handed off (Manser, Foster, Flynn, & Patey, 2013). One way to address these handoff differences is to standardize handoff methods for specific healthcare specialties (Wayne et al., 2008).

It is well documented that standardized hand-off methods such as checklists result in improved memory recall, increased efficiency of complex processes, fewer adverse outcomes

and enhanced communication and teamwork (Hales & Pronovost, 2006; Lingard et al., 2005). Checklists can help standardize and coordinate a process to improve performance and safety among health care providers. Currently, a variety of standardized hand-off tools have been designed for improving the handoff process across health care settings, such as The SAFE handover tool and Situation Background Assessment Recommendation (SBAR), I PASS THE BATON, and HAND-IT (Abraham et al., 2014; Amato-Vealey, Barba, & Vealey, 2008; Department of Defense, 2005; Dharmadasa et al., 2014). The SAFE handover tool significantly increased handover rates of anesthesiologically relevant information regarding parturients, or women about to give birth, and the Situation Background Assessment Recommendation (SBAR) was developed for efficient and effective communication among a variety of health care providers. These tools have been shown to significantly reduce adverse outcomes without significantly altering workflow (Amato-Vealey, Barba, & Vealey, 2008; Dharmadasa et al., 2014).

In the 1990's, Safe Healthcare brought SBAR into the healthcare setting from the United States Navy and has since been used by healthcare facilities around the world as a "simple yet effective way to standardize communication between caregivers" (Safer Healthcare, 2015). The diverse and popular acronym SBAR can be applied in the preoperative, intraoperative, and postoperative arenas. To illustrate how SBAR can be tailored to these transfer of care scenarios, Amato-Vealey and colleagues (2008) described the optimal components to include in SBAR when a patient transitioned from preoperative to intraoperative care, intraoperative to post anesthesia care unit (PACU), and from PACU to an inpatient unit.

While SBAR has been applied to many types of handoffs, there are other tools designed specifically for a certain transition of care. The SWITCH tool was specifically designed to be used in the perioperative environment. The acronym, SWITCH, stands for surgical procedure,

wet, instruments, tissue, counts and have you any questions (Johnson, Logsdon, Fournier, & Fisher, 2013). Another acronym, I PASS the BATON, stands for introduction, patient, assessment, situation, safety concerns, background, actions, timing, ownership, and next (Johnson, Logsdon, Fournier, & Fisher, 2013). The SHARQ mnemonic is similar to SBAR but adds an opportunity for questions. SHARQ stands for situation, history, assessment, recommendations, and questions (Johnson, Logsdon, Fournier, & Fisher, 2013).

Other tools such as HAND-IT, a handoff intervention tool, focus on the body system format (Abraham, Kannampallil, Almoosa, Patel, & Patel, 2014). An example of a handoff tool based on the patient problem is SOAP standing for: subjective, objective, assessment, plan. These existing handoff tools illustrate a generic format, so they can be utilized by a variety of healthcare providers in a variety of settings.

Over the past ten years, various standardized hand-off tools have been developed to improve communication between health care providers, but there are few anesthesia-specific handoff tools. To address this gap, Wright (2013) conducted a study for improving the quality and effectiveness of the anesthesia transfer of care. This was done through a two-phase study. First, Wright surveyed certified registered nurse anesthetists (CRNA) to examine the current transfer of care processes. She used those results to develop, implement and evaluate the creation of the PATIENT protocol. The mnemonic provides a systematic checklist to be used by anesthesia providers during transfer of care. The following describes what each letter of Wright's (2013) PATIENT mnemonic represents: P – Procedure, patient (quick scan), position; A – Anesthesia, antibiotic, airway, allergies; T – Temperature; I – IVs and other invasive lines; E – ETCO₂ and ventilatory status; N – Narcotics; T – Twitches.

Through evaluating the PATIENT protocol, Wright (2013) found that there was a gap in the transfer of care process among anesthesia providers and that a change in current practices may be met with resistance by some practitioners. In addition, the handoff tool developed by Wright is lengthy, with many components so it is might not be easy or realistic to use in practice. This protocol, however, is one of the few attempts to fill the gap. The transfer of care process between anesthesia providers is still undefined and not standardized. There is a need for more studies specifically addressing the transfer of care process between anesthesia providers.

Problem Statement

Currently, there is no protocol or standard of practice for transfer of care between anesthesia providers. While the PATIENT protocol was developed to improve communication between anesthesia providers, the results of this study suggested adopting the protocol might be met with resistance (Wright, 2013). It was a step in the right direction but complete standardization of practice has yet to occur. As such, there is huge variability in information given and received during handoff between all levels of anesthesia providers. Inadequate or inconsistent communication between anesthesia providers significantly increases risk of patient harm, resulting in missed opportunities for optimal patient care. The increase in current handoff research has focused on the transfer of care process between different care settings such as from the operating room to the intensive care unit or between two operating room nurses (Johnson et al., 2013). Gaps in handoff research were identified and include examining what a quality, safe and effective handoff looks like to anesthesia providers considering the dynamic handover experience (Manser, 2011; Manser, Foster, Flynn, & Patey, 2013). Despite a growing awareness that a standardized handoff tool is critical to providing safe and effective patient care, there are limited studies to assess the need for the development of such tools.

Purpose of the Project

The purpose of this descriptive survey project was 1) to assess the need for a standardized handoff tool for anesthesia providers and 2) to identify the most essential components, influenced by the PATIENT protocol, for the development of a handoff tool to be used during the transfer of care between anesthesia providers. Thus, findings of this project helped constitute the foundation for the development of a concise, efficient handoff tool to be used during transfer of care between anesthesia providers.

Clinical Questions

The following clinical questions were addressed through this research:

- What is the perceived need for a standardized handoff tool for anesthesia providers?
- What do anesthesia providers believe are the most essential components, influenced by Wright's (2013) PATIENT protocol, to guide the development of a concise, efficient handoff tool to be used during transfer of care between anesthesia providers?

To further define the most essential components of a handoff, questions specifying handoff components focused on safety, anesthesia-specific factors and handoff quality were addressed.

Conceptual Framework

Theorists Ryan Watkins and Ingrid Guerra-Lopez developed the theory of Needs Assessment vs. Evaluation (2002). The theory's principles are: 1) needs assessments are substantially different from evaluations, 2) needs assessment rely on a different knowledge-base and perspective from evaluations, though they share data collection techniques. Watkins and Guerra suggested that while evaluations and assessments utilize the tools and procedures to collect data on a current process or activity, the questions they hope to answer are different. An evaluation hopes to collect results that match the results expected from interventions or solutions

already implemented. In contrast, an assessment seeks to collect data on what currently is and what potentially could be. This information is used to anticipate the most successful intervention before it is implemented.

The conceptual framework developed for this research study was a combination of two theories including the transactional model of communication introduced by Barnlund in 1970 and the cooperative shift change (Durso, Crutchfield & Harvey, 2007). First, the transactional model of communication describes two communicators who both send and receive a message. The model also includes the environment as part of the experience, made up of the noise of the physical location as well as the physiological and psychological experience of the communicators.

Secondly, Durso et al (2007) developed the cooperative shift change theoretical framework for air traffic controllers during shift change. The framework consists of four phases: end of shift, arrival, meeting, taking post. In the end of shift phase, the oncoming controller learns as much as possible about what's going on. Then, in the arrival phase, they sit-in and observe the scene gaining situational awareness. In the meeting phase, brief verbal communication guided by a checklist occurs. Finally, the taking post phase distributes equal responsibility to both the ongoing and leaving controllers to confirm that accurate situational awareness and essential information is discussed.

Combined together, the cooperative shift change framework and the transactional model of communication results in the observation, transaction, confirmation (OTC) conceptual framework for handoff between anesthesia providers. Similar to the arrival phase of the cooperative shift change framework, the observation phase consists of the oncoming anesthesia provider gaining as much information as possible about the transfer of care situation before

arriving to the handoff location. During this time, the anesthesia provider should collect information about the surgeon, procedure, anesthesia provider and location.

The transaction phase of the OTC conceptual framework utilizes the transactional model. This phase is similar to the meeting phase of the cooperative shift change framework and includes the details of the transactional model. The communicators are the oncoming and outgoing anesthesia providers. They have a brief conversation, ideally utilizing a structured checklist or tool, in which information is given and received between the two communicators. Distractors are considered during this phase. External noise includes music, talking and equipment. Examples of physiological distractors of the communicators are stress, fatigue or illness. In addition, psychological factors are differences in willingness, age, power, role, and attitude between the anesthesia providers.

The final phase of the OTC conceptual framework is the confirmation phase. This phase parallels the cooperative shift change framework's taking post phase. After the transaction phase, the communicators should provide feedback and confirmation that all information has been shared accurately and completely. Both communicators verbally confirm that they have provided and received satisfactory information allowing the oncoming provider to be able to adequately provide anesthesia to the patient for any length of time. The observation, transaction, and confirmation phases provide a framework consistent with existing concepts for transfer of responsibility events and communication.

Chapter 2. Literature Review

A comprehensive review of existing literature and research was conducted to serve as the basis for the purpose of this project. Academic search engines such as CINAHL and PubMed using search words *handoff, handover, transfer of care, anesthesia, shift change, communication,*

report. Search results included years 2010 – present and peer-reviewed journals. Handoff methods, communication, education and successful handoff tools were reviewed.

Handoff Methods: Checklists

Shift change in air traffic control pioneered the research on shift change and communication in the healthcare setting. Relating transition of care of aircraft between air traffic controllers to that of hospitalized patients between health care providers, the researchers explored the importance of critical moments occurring during shift change. The study also described the use of a checklist developed by the Federal Aviation Administration to facilitate the shift change (Durso, Crutchfield & Harvey 2007). Checklists are tools designed to accomplish tasks by minimizing human error. Beaumont and Russell (2012) described how two specific checklists aimed to improve patient safety through standardizing evidenced-based guidelines and increasing reliability of patient care. They also described how using technology increases the reliability and aids in standardization. In a separate study conducted by Wayne and colleagues (2008) in which a standardized handoff tool was created and embedded in the electronic medical record, it was found that users of the tool perceived more accurate and complete handoff. One of the initiatives Beaumont and Russell describe is *How to Guide: Five Steps to Safer Surgery* developed by the National Patient Safety Agency as an adjunct to the World Health Organization's (WHO) Surgical Safety Checklist (WHO, 2008).

Since its conception, the WHO Surgical Safety Checklist has been implemented and studied around the world. In 2009, Haynes et al published a study evaluating the rates of death and complications after implementing the WHO Surgical Safety Checklist. This study was comprehensive and included eight hospitals in eight cities around the world allowing the results to be generalized to a variety of hospitals worldwide. Nearly 4000 subjects were evaluated

improving the power of the results. The researchers concluded that after implementation of the checklist, there were fewer inpatient complications and reductions in rates of death.

Fudickar and colleagues conducted a literature review in 2012 evaluating the effect of the WHO surgical safety checklist on complication rates and communication. Their review focused on all available data published before 2012. The results from those studies were analyzed to describe the effect the WHO surgical safety checklist had on morbidity and mortality and communication. From the twenty studies included as relevant and original, they found improvement in morbidity and mortality and improved interdisciplinary communication. In addition to efficacy and safety culture, the reviewed studies focused on practical implementation, training, costs and acceptance among patients. The results of this literature review confirmed the benefits of a checklist on complications rates in the operating room.

A review done by Hagerman et al. (2014) found that quality improvement initiatives such as checklists in pediatric anesthesia have improved delivery of effective and efficient care. They reviewed studies proving that checklists improved crisis situations by increasing compliance with evidenced-based care, decreased catheter-associated bloodstream infection, limited the use of blood products and improved communication during handoff between different disciplines of health care providers. The evidence provided in their research further supported the effectiveness of checklists.

Hand-Off Communication

Leonard and colleagues published an article in 2004 describing the importance of overcoming human factors by effective teamwork and communication to provide safe care. The success they've had at Kaiser Permanente is credited to embedding standardized tools and behaviors into everyday practice for all healthcare providers. The tools and behaviors include

SBAR, appropriate assertion, and critical language. By standardizing these behaviors, teamwork and communication improved and therefore patient care improved. Not only are teamwork and communication vital to handoff, but quality is also important. Manser and colleagues prospective, cross-sectional observation study, found that with large variability in handoff practices came large variability in perceived quality of the handoff (Manser, Foster, Flynn, & Patey, 2013). The perceived higher quality handoffs included assessments and anticipated problems.

To assess the quality of handoffs, Pezzolesi et al. (2012) developed and tested a handoff performance tool. Using human factor experts and doctors to validate the tool, the researchers concluded that communication determined the majority of handoff quality (Pezzolesi et al., 2012). In addition to communication, teamwork and situation awareness help determine the quality of a handoff. Furthermore, the authors describe the handover performance tool as one that can be used to systematically assess handovers between doctors as well as an educational tool to healthcare professionals in training (Pezzolesi et al., 2012). Tapia, Fallon, Brandt, Scott, and Suliburk (2013) also evaluated handoff processes before proposing a mnemonic solution. Based on the evaluation, they found current handoff practices to be very unstructured and consisting of incomplete tasks and information (Tapia et al., 2013).

Since the designation of “standardized approach to hand-off communication” as a National Patient Safety Goal by JCAHO in 2007, tools and models have been released to help healthcare facilities implement the goal. In 2006, JCAHO released a model for building a standardized hand-off protocol between residency trainees at academic teaching hospitals (Arora & Johnson, 2006). The model consists of four steps. The first step is deciding on a process and creating a process map to visualize the flow of communication. The model includes a process

mapping tutorial meant to be built specifically for the type of hand-off given. The second step is determining the content of the handoff, creating a checklist. The third step is called implementation and requires buy-in from the leadership and the users of the handoff. Lastly, they describe the final step, monitoring, as establishing a way to ensure the protocol is used and to resolve any barriers to it. Residency trainees developed a standardized process for handoff to be analyzed. Analysis revealed the high variability and discipline-specific handoffs that occur such as including psychiatric history and social issues as critical content for a psychiatry handoff and custody issues for a pediatric handoff (Arora & Johnson, 2006). However, the model proved to be versatile in its functionality, able to be applied in other health care arenas.

The Joint Commission Center for Transforming Healthcare also developed a tool to aid in handoff communications. The tool is called the Targeted Solutions Tool and is built on the idea that the sender and receiver have different expectations of what a good handoff consists of (JCAHO, 2012). The targeted solutions to a better handoff include standardization of critical content, hardwiring checklists within the system, allowing opportunities to ask questions, reinforcing quality and measurement and education of a successful handoff. The tool includes customization, guidelines for success and a measurement system of communication improvement (JCAHO, 2012).

Handoff Education

Developing and implementing checklists with the goal of improving communication requires education on how to effectively utilize the checklist. In a study done by Horwitz, Moin and Green (2007), a needs assessment for standardized handoff education and literature review was conducted to identify an existing curriculum. After identifying the gap for education of physician-to-physician communication, the researchers developed an oral sign out skills

curriculum as well as the mnemonic, SIGNOUT, specific to the information determined to be useful in handoff between internal medicine interns (Horwitz, Moin & Green, 2007). Their findings showed that the SIGNOUT mnemonic was perceived as better than SBAR and that the curriculum was well received by those uncomfortable in providing handoff (Horwitz, Moin & Green, 2007).

In the large prospective intervention study conducted by Starmer et al. (2013), a comprehensive handoff program was implemented. The program included many aspects discussed in this literature review including a newly developed checklist to standardize communication, handoff training and a new team handoff structure that included interns and senior residents handing off as a team in a quiet location (Starmer et al., 2013). After the program was implemented, the researchers concluded there was a significant decrease in medical errors as well as preventable adverse events (Starmer et al., 2013). All of this was accomplished without adversely changing workflow and incorporated technology in the handoff (Starmer et al., 2013). This study illustrated all of the components required to successfully change handoff procedures resulting in better patient care (Starmer et al., 2013).

Successful Handoff Tools

The SBAR handoff tool is successful across a variety of disciplines in healthcare. It is versatile and widely used during transfer of care. One study described successful use of a structured handover tool between obstetric anesthesia providers with increased handover rates of sick and at-risk parturients (Dharmadasa et al., 2014). Another study determined with overwhelming agreement that standardization of handoff between anesthesia providers is needed and should be part of the electronic medical record (Jayaswal et al., 2011).

In summary, the literature consistently supports the importance of checklists. Especially when integrated in the electronic health record, checklists are vital in improving outcomes and reducing adverse events. Standardizing communication improves reliability, higher ratings of quality and completion of tasks. In addition, the literature is clear on how education on handoff effectively leads to a reduction in errors and increased comfort with providing handoff. However, there is limited literature to specifically address handoff between anesthesia providers. The slowly growing body of evidence supports the need for more research on anesthesia-specific handoff checklists, communication, education and evaluation.

Chapter 3. Methods

Research Design

A descriptive survey research design was conducted. To achieve the objectives of this study it was not necessary to implement or manipulate anything and assess the change or outcome achieved as in experimental studies. This research provided information on current handoff processes between anesthesia providers as well as anesthesia providers' opinions on the most essential aspects to include in the anesthesia-specific handoff tool. The project describes anesthesia handoff procedures and attitudes as they currently exist and provides insight for future studies.

Sampling

A convenience sample of 100 anesthesia providers practicing in the greater Chicago, Illinois area at large, academic hospitals was sampled. The sample included certified registered nurse anesthetists, student registered nurse anesthetists, anesthesia residents, and anesthesiologists working at NorthShore University Health System and University of Illinois at Chicago Medical Center. Participants met inclusion criteria of being English-speaking, legally

permitted to provide anesthesia in the state of Illinois independently or under direct supervision of an anesthesia provider, having a minimum of six months of providing anesthesia, and currently practicing anesthesia. Exclusion criteria comprised of those who are not English-speaking, legally permitted to provide anesthesia in the state of Illinois, those with less than six months of anesthesia experience, and those who do not currently provide anesthesia.

Approval from the NorthShore University HealthSystem and DePaul University institutional review boards were obtained on September 4, 2015. Approval from the University of Illinois at Chicago international review board was obtained on September 24, 2015. There were no physical or psychological risks associated with this research. The survey was anonymous, confidential and voluntary. The target sample size was 100 participants. Potential participants received a recruitment email containing an attached information sheet to ensure they were aware of the voluntary and anonymous nature of the survey. Participants were informed that review of the information sheet and continuation to the survey served as their voluntary agreement to participate.

Setting

Participants were recruited from NorthShore University HealthSystem and University of Illinois at Chicago Hospital & Health Sciences anesthesia departments. Once IRB approval was obtained, a recruitment email was distributed to the anesthesia department at NorthShore University HealthSystem by Julia Feczko DNP, CRNA and to the anesthesia department at the University of Illinois at Chicago Hospital and Health Sciences by Randall Dull, PhD, MD. Copies of IRB approval forms from NorthShore University HealthSystem, DePaul University, and University of Illinois at Chicago can be found in appendix E. The staff advisors did not recruit but simply distributed the email. The information sheet for participation in research was

also attached to the recruitment email. A copy of the recruitment email and information sheet can be found in appendix C and A respectively. A secure, anonymous link to the survey was included in the email. Dr. Feczko and Dr. Dull gained access to the department email addresses through the department contact lists. The primary investigator never had access to potential study participants' email addresses.

Instruments

The study survey asked multiple choice questions regarding demographics, a needs assessment for a standardized handoff tool for anesthesia providers, current anesthesia handoff practices, and essential components of anesthesia handoff (appendix B). Demographic information collected included: the participants' role, years of experience, hours worked per week, gender and ethnic origin. Needs assessment questions included whether current practices include a systematic process for handoff, frequency of inadequate information given and received and frequency of missed information. Lastly, to assess the most essential components to include in handoff, questions concerning components regularly given and received during handoff identifying the most essential components were asked.

The survey questions were influenced by the existing questionnaire developed by Wright (2013) for her study and development of the PATIENT Protocol. Modifications were made to best answer the research questions of this study. The validity of Wright's (2013) questionnaire was established through the review and input from two academicians, two anesthesia providers and an administrator.

Ethical consideration

The institutional review boards from the DePaul University and the NorthShore University HealthSystem and University of Illinois at Chicago Hospital reviewed this study prior

to data collection. Participation in this study was voluntary and anonymous. To ensure anonymity, the survey host site was asked not to provide IP addresses with submitted surveys. An information sheet was provided to all participants describing the purpose of the study, contact people and to give participants the right to withdraw at any time without penalty and confidentiality. An explanation that their completion and submission of the survey served as their informed consent. Only the researcher had access to the data obtained from the survey. Surveys were destroyed electronically once data analysis was complete. Research personnel were trained on human subject protections by the collaborative institutional training initiative. Training was completed on May 17, 2015 and expires on May 16, 2018. Copies of CITI training completion certificates can be found in appendix F.

Risks and Benefits

There were no physical or psychological risks associated with this research. The survey was anonymous and confidential. Benefits included reflection on current handoff practices and positively adjusting current anesthesia practice to improve handoff.

Data Collection Procedure

Upon IRB approval from DePaul University, NorthShore University Health System and the University of Illinois Chicago, subjects were recruited via the email address provided to their respective anesthesiology department. The primary investigator did not have access to any email addresses of potential subjects. The staff advisors gained access to the email addresses from the department contact list and distributed the survey through a qualtrics.com link.

A recruitment email (appendix C) was sent by staff advisors and contained an attached information sheet (appendix A) as well as a secure link to the survey (appendix B) via depaul.qualtrics.com. The survey was not developed by the investigator and has been adapted

from the existing PATIENT protocol survey developed by Wright (2013). The survey asked questions regarding anesthesia experience demographics, current handoff practices, and what the most essential components of an anesthesia handoff consist of and required about 10 minutes of the participants' time. Those who voluntarily completed the anonymous and confidential survey were included in the research.

Data analysis

Raw data was securely downloaded from Qualtrics. Data collected from the surveys were analyzed using Microsoft Excel for Mac 2011 version 14.5.3 and SPSS for Mac version 23 using descriptive statistics to describe frequencies and means.

Chapter 4. Results

This chapter presents the results of this study. The first section describes the sample. In the second section, the perceived needs for a standard handoff tool and the essential components to be included in a handoff tool were discussed. Finally, a new handoff tool to be used during transfer of care between anesthesia providers is proposed.

Description of Sample

Ninety-one participants responded to the survey, but it was decided to delete the survey if more than 50% of questions in the survey were not answered. As a result, a total of 82 participants finally participated in the study. As seen in Table 1, most of the participants were anesthesiologists (n = 34, 41.5%) or currently in residency for anesthesia (n = 27, 32.9%) whereas 21 participants (25.6%) were certified or student registered nurse anesthetists. A majority of respondents (n = 62, 75.6%) spend more than 36 hours per week providing anesthesia and have been providing anesthesia for 2-5 years (n = 28, 34.1%). There was a

slightly greater number of male participants (n = 44, 54.7%) than female (n = 38, 46.3%) and most identified their ethnic origin as white (n = 58, 70.7%).

Table 1. Study Participants Sociodemographics

Variables (N=82)	Frequency	Number (N)	Percent (%)
Role	Attending Anesthesiologist	34	41.5
	Certified Registered Nurse Anesthetist	17	20.7
	Student Registered Nurse Anesthetist	4	4.9
	1 st year Anesthesia Resident	1	1.2
	2 nd year Anesthesia Resident	5	6.1
	3 rd year Anesthesia Resident	11	13.4
	4 th year Anesthesia Resident	9	11
	Anesthesia Fellow	1	1.2
	Total	82	100
	Experience providing anesthesia	Less than 6 months	2
6 months – 1 year		9	11
2-5 years		29	34.1
6-10 years		9	11.0
11-15 years		10	12.2
16-20 years		5	6.1
21-25 years		6	7.3
26-30 years		7	8.5
31-35 years		4	4.9
Over 35 years		2	2.4
Total	82	100	
Hours/week providing anesthesia	Less than 36 hours	20	24.4
	More than 36 hours	62	75.6
	Total	82	100
Gender	Male	44	53.7
	Female	38	46.3
	Total	82	100
Ethnic Origin	White	58	70.7
	Black, African, African American	1	1.2

Asian, Pacific Islander, Native Hawaiian	18	22.0
Hispanic, Latino, Spanish origin	2	2.4
Total	79	96.3

Perceived Need for a Standardized Handoff Tool

To address the first clinical question, which asked about the perceived need for a standardized handoff tool for anesthesia providers, subjects were asked whether or not they currently used a systematic process to communicate information during handoff from one anesthesia provider to another. Of the 82 responses, 53 participants (64.6%) denied currently having a systematic process for anesthesia handoff. The remaining 29 respondents (35.4%) who replied that they did have a systematic process for anesthesia handoff could provide a free-typed description of their current handoff process. There were 21 free-typed responses comprising of about 20 categories with the most frequently described being patient history, medications given, plan/goals and case-specific concerns. In addition, airway management, type of surgery and IV access were frequently free-typed as part of current handoff processes.

To further assess a perceived need for a standardized handoff tool, participants were also asked how often they felt they were given inadequate information during transfer of care (Table 2). Twenty-two respondents (26.8%) felt they rarely or never were given inadequate information whereas nineteen respondents (23.2%) felt they were given inadequate information most of the time or always. Half of the respondents ($n = 41$, 50%) felt they sometimes were given inadequate information. When asked about how often they felt they gave inadequate information to others during transfer of care, 40 (48.8%) answered with rarely or never. Thirty-one participants (37.8%) replied they sometimes gave inadequate information and 11 (13.4%) felt they gave inadequate information most of the time or always. When asked how often they

discovered something that wasn't discussed during handoff, 34 (41.5%) replied rarely or never and similarly 40 (48.8%) felt they sometimes discovered something that wasn't discussed. Only eight participants (9.8%) felt they discovered something that wasn't discussed most of the time or always.

Table 2. Perceived Need for Standardized Handoff Tool

<i>Variables (N=82)</i>	<i>N (%)</i>	<i>N (%)</i>	<i>N (%)</i>
	<u>Never</u>	<u>Sometimes</u>	<u>Always</u>
How often do you feel you are <u>given</u> inadequate information during transfer of care?	22 (26.8%)	41 (50%)	19 (23.2%)
How often do you feel you <u>give</u> inadequate information during transfer of care?	40 (48.8%)	31 (37.8%)	11 (13.4%)
How often do you discover something that wasn't discussed during handoff?	34 (41.5%)	40 (48.8%)	8 (9.8%)

Essential Components of Standardized Handoff Tool

Current practice of handoff. The second clinical research question sought to reveal the components of anesthesia handoff that anesthesia providers believed were the most essential. Two survey questions asked participants about current handoff practice. First, participants were asked how often they provided each of a given eighteen components of handoff to others. Second, they were asked how often they received information on each component from another anesthesia provider during transfer of care. Table 3 displays the frequencies each component was used in current handoff as well as ideal handoff. The most frequently used components had responses of always or most of the time by 85% of participants. The most frequently provided components in the current practice were airway type, airway difficulty, analgesia, anesthetic type, invasive lines, patient medical history, procedure and vital signs. The components participants most frequently received from others during handoff were airway difficulty, invasive lines, medical history and procedure.

Ideal handoff practice. In addition, participants were asked which components are essential to be included in anesthesia handoff. The most essential components of handoff identified were airway type, airway difficulty, allergies, anesthetic type, invasive lines, patient medical history, procedure and vital signs. The allergies component was determined to be essential for an ideal handoff however was not one of the most frequently provided or received components in current practice. The results of most essential components of current and ideal handoff practices reveal the most essential components to anesthesia handoff are airway difficulty, invasive lines, medical history and procedure.

Table 3. Most Essential Components of Handoff

Essential component	Current handoff practice						Ideal handoff practice		
	How often do you provide the following information?			How often do you receive the following information?			How essential are the following components?		
	Never	Sometimes	Always	Never	Sometimes	Always	Not	Somewhat	Essential
Airway type	4	12	70*	3	16	63	1	9	72*
Airway diff.	1	0	81*	1	5	76*	0	2	80*
Allergies	10	18	54	14	34	34	0	11	71*
Analgesia	3	8	71*	4	21	57	0	22	60
Anesthetic	6	3	73*	5	13	64	3	9	70*
IV	1	5	76*	3	9	70*	1	6	75*
Medical hx	1	2	79*	0	5	77*	0	4	78*
Procedure	1	2	79*	0	4	78*	0	3	79*
Vital Signs	5	6	71*	2	18	62	1	8	73*

Abbreviations: diff., difficulty; IV, invasive lines; hx, history

*: most commonly identified components

Participants were then asked to rank the components of the PATIENT Protocol developed by Wright (2013) in order from most essential (1) to least essential (12). As shown in Table 4, the factors ranked most essential were patient and airway. These were followed by procedure, allergies, anesthesia and IVs and other invasive lines. Temperature and twitches both ranked least essential.

Table 4. Components Ranked in PATIENT Protocol

<i>Rank PATIENT Protocol variables (N = 78)</i>		
<u>Variable</u>	<u>Mean</u>	<u>Mode</u>
Patient	2.4	1
Airway	2.9	1
Procedure	3.6	2
Anesthesia	4.2	3
Allergies	6.0	3
IVs and other invasive lines	6.1	6
ETCO2 (ventilation)	6.9	6
Narcotics	8.4	11
Position	8.5	6*
Antibiotic	8.7	8
Twitches	9.3	12
Temperature	11	12

*Multiple modes exist, smallest value shown

Comparison between ideal handoff tool and rank PATIENT protocol. The top five ranked components of the PATIENT protocol are patient, airway, procedure, anesthesia, and allergies. The top five components of the ideal handoff are airway difficulty, procedure, patient medical history, invasive lines, vital signs. Of these, patient medical history, airway difficulty, and procedure are consistent with the PATIENT protocol components patient, airway, and procedure. In addition, allergies, and invasive lines are also consistently highly ranked among the ideal handoff and the PATIENT protocol. Anesthesia was determined essential in the PATIENT protocol however was not essential to an ideal handoff tool.

Description of A New Anesthesia Handoff Tool “TIME”

Considering the conceptual framework observation transaction confirmation (OTC) (appendix D, figure 1) and major findings from this study, importance of systemic checklists and mnemonics to handoff and anesthesia-specific workflow, the anesthesia handoff tool TIME is proposed (appendix H). The OTC conceptual framework begins with observations, being aware

of things you can see. The oncoming provider enters the correct location, sees the outgoing provider, notices the surgeon, patient position, procedure being performed, monitors and type of anesthetic. These are all objective qualities that are simply observed. The next phase of the OTC conceptual framework is the transactional phase. The 'T' in the TIME mnemonic represents the initiation of this phase (appendix D, figure 2). The oncoming provider exchanges information with the outgoing provider. The outgoing provider begins the transaction by providing information regarding the patient including medical history and allergies, components determined essential to be essential to handoff. Next, the 'I' represents induction. The outgoing provider provides a summary about the induction phase including airway, invasive lines used and medications given during induction. The 'M' stands for information on the maintenance phase. Information specific to the case is shared such as how far along in the case is it, what interventions have been done or need to be completed, as well as maintenance medications including analgesics and neuromuscular blockers. The 'E' of TIME represents emergence. A brief statement regarding plan for emergence or goals for the case, medications such as reversal and antiemetics can be included during this phase. Finishing the OTC conceptual framework with the confirmation phase, feedback and further verification that all information is accurate and understood completes the handoff.

Chapter 5. Discussion

This chapter presents a summary of the findings associated with each clinical questions, conceptual framework, limitation, implications for practice, and recommendation for future research concerning development of handoff tool for anesthesia providers.

Discussion of Major Findings

Most anesthesia providers participating in this study felt that handoff from their peers lacked information necessary to adequately care for their patient. About half of participants admitted they themselves sometimes, most of the time or always gave inadequate information to others. While providers might tend to perceive their personal practice as superior to their peers many acknowledged they also contributed to inadequate handoff, further supporting it as an area in need of standardization. In addition, a majority of participants revealed they discover something that wasn't discussed during handoff sometimes, most of the time or always. The results from this study indicate that most participants perceive that both their peers and themselves currently provide inadequate handoff. A standardized handoff tool specific for anesthesia providers can help improve memory, increase efficiency, fewer adverse outcomes and enhance communication (Hales and Pronovost, 2006; Lingard et al., 2005).

To evaluate the factors anesthesia providers believed were most essential to handoff, participants were asked questions regarding current and ideal handoff practices. Airway difficulty, invasive lines, medical history and procedure were found currently and consistently communicated in handoff. Participants currently give and receive information on those categories during handoff. Six out of seven of the components participants believed to be essential to an ideal handoff were consistent with the components currently used during handoff. Analgesia was always provided by at least 85% of respondents as part of their current handoff practice however not determined to be an essential factor. One component, allergies, was deemed essential to handoff however was not provided in current practice.

Based on the components that are currently given by most providers, currently received from most providers and determined to be essential to an ideal handoff, the most essential components to anesthesia handoff are airway difficulty, invasive lines, medical history and

procedure. Of the top five ranked components of the PATIENT protocol (Wright, 2013), patient, airway, and procedure are consistent with the most essential components determined by this study. Allergies was ranked among the highest of the PATIENT protocol and was believed to be one of the most essential components by participants, however was not one of the factors used in current practice. Participants believe allergies is one of the most essential components to include in an ideal handoff although do not use it in current handoff practices.

Considering open-ended responses by participants who currently use a standardized method for handoff, *medications given*, *plan/goals* and *case-specific concerns* should also be considered essential as they were frequently used in current practice however were not options for survey questions. Including a more generic medications category on the survey would have included the specific medication classes like analgesia, antibiotics and antiemetics as well as anesthesia. The high the ranking and frequency in the open-ended responses identifies medications as an essential component of handoff. In addition, case-specific concerns was frequently free-typed and could be interpreted as part of the procedure component from the list provided by the survey. The free-typed response of plan/goals does not have an associated survey component and should be determined as one of the most essential components to include in anesthesia handoff. Therefore, any proposed anesthesia handoff tool should minimally address airway difficulty, invasive lines, medical history, procedure/case-specific concerns, allergies, medications and plan/goals.

New Anesthesia Handoff Tool “TIME”

The “TIME” handoff tool was developed to be a concise and efficient tool for anesthesia providers to use during transfer of care. Utilizing the results of this study as well as the influence of Wright’s PATIENT protocol, the acronym TIME was created. The OTC conceptual

framework introduced in this paper provides the foundation for handoff. This was strongly considered while developing an acronym that could be concise, efficient, and applicable to any situation involving anesthesia handoff. Because the transaction phase of the OTC framework is when the interaction between providers occurs, the letter T was important to the acronym. Next, an anesthesia-specific organization of events was decided to be a logical and adaptable way to efficiently communicate the most essential components of a case from one anesthesia provider to another. An anesthetic is often divided into three phases: induction, maintenance, and emergence. From this, the letters I, M, and E were added to complete the TIME acronym.

The TIME handoff tool differs from the PATIENT protocol in length and organization. In the TIME handoff tool, there are four letters to the acronym, each representing a chronological order of events that can be addressed at any point in a case to any provider. This creates an efficient method to organize the important components of handoff. In contrast, the PATIENT protocol consists of a seven letter acronym with each letter representing one, three, or four components of handoff. This protocol also includes components that were determined to be not essential to handoff.

Limitations

Several limitations for this study were identified. The nonrandom sampling procedures may have introduced selection biases and impaired the generalizability of the results. Study participants were recruited only from two specific institutions in the Chicagoland area. The handoff practices and perceptions greatly vary depending on practitioners, geographic location, and workplace. Therefore, these findings should not be generalized to other anesthesia providers. The survey itself had limitations. The list of handoff factors was limited and very specific. As recognized earlier, medications as a general category rather than divided into

classes could have yielded different results. Thus, the study may not have captured the potential factors influencing handoff. Another limitation of this study include use of a convenience sample, single-informant self-report methodology, and a cross-sectional design. An inherent limitation are the few existing anesthesia-specific handoff tools to compare the TIME tool to.

Nursing Implications

Certified registered nurse anesthetists (CRNA) safely administer around 40 million anesthetics in the United States annually and comprise of over 50,000 practitioners according to the American Association of Nurse Anesthetists 2014 Practice Profile Survey. Each of the anesthetics provided by a CRNA can be more effective, more efficient and results in fewer adverse outcomes if an appropriate standardized tool is used (Amato-Vealey, Barba, & Vealey, 2008; Dharmadasa et al., 2014). The findings of this research contributes to changing the handoff practice of CRNAs by identifying a need for standardization and identifying the most essential components of handoff. Employers of CRNAs should consider adopting the TIME handoff tool as a standard of practice to promote more effective and efficient communication. Improved communication with other anesthesia providers can also enhance the collaborative and teamwork environment for all anesthesia providers involved.

Direction for Future Research

Similar to the two-phase study conducted by Wright (2013), the proposed TIME handoff tool can be implemented and evaluated in the future for its feasibility and acceptability. Specifically, research on education of the OTC conceptual framework and integrating TIME into the electronic charting system can be a direction for future research. Both of these would require buy-in from departmental leadership. With leadership recognizing the value of this research, implementation and dissemination throughout the department can occur. The literature review

completed for this study supports handoff education, electronic integration and checklist mnemonics. Given the limited sample size and discussed survey limitations, more research on existing anesthesia handoff practices is greatly needed.

Conclusion

Currently, there is no protocol or standard of practice for transfer of care between anesthesia providers. The needs assessment conducted through a descriptive survey provides information on current handoff processes between anesthesia providers as well as anesthesia providers' opinions on the most essential aspects to include in handoff. This study found that that most participants perceive that both their peers and themselves currently provide inadequate handoff. The most essential components to include in anesthesia handoff as a result of this study should minimally address airway difficulty, invasive lines, medical history, procedure/case-specific concerns, allergies, medications and plan/goals. Thus, guided by the conceptual framework observation transaction confirmation (OTC) and the major findings of this study, the TIME anesthesia handoff tool is proposed as a concise, efficient handoff tool to be used during transfer of care between anesthesia providers.

Appendix A

Information Sheet for Participation in Research Study

A Needs Assessment for the Development of an Anesthesia Handoff Tool

Researcher: Courtney Gibney, RN, Graduate Student

Institution: DePaul University, Chicago, IL, USA

Faculty Advisor: Young-Me Lee, PhD., Nursing Department

Research Team: Elizabeth Florez, PhD., DePaul University Nursing Department; Julia Feczko, PhD., NorthShore University Health System School of Nurse Anesthesia

Collaborators: NorthShore University Health System and University of Illinois at Chicago Hospital and Health Sciences

I am Courtney Gibney, a junior student nurse anesthetist at NorthShore University Health System School of Nurse Anesthesia. I am conducting a research study for my Doctorate of Nursing Practice through DePaul University under the supervision of committee chair Dr. Young-Me Lee (ylee23@depaul.edu) from the Nursing Department at DePaul University.

I am conducting a research study to learn more about handoff between anesthesia providers. The purpose of my study is to

- 1) to assess the need for a standardized handoff tool for anesthesia providers
- 2) to identify the most essential components of handoff for the development of a handoff tool to be used during the transfer of care between anesthesia providers

My goal is to use my findings as the foundation for the development of a concise, efficient handoff tool to be used during transfer of care between anesthesia providers.

I am asking you to be in the research because you have been providing anesthesia for more than six months and are currently practicing. If you agree to be in this study, you will be asked to complete a survey. You will be provided a link for the survey via email through a secure website www.depaul.qualtric.com. The link will be available for a limited time and the survey should take about 10 minutes to complete.

The survey includes questions regarding demographic information such as your role in anesthesia, years of experience, amount of time spent providing anesthesia, gender and ethnic origin. In addition, the survey asks questions about your role and experience as an anesthesia provider, questions regarding current anesthesia handoff practices, and questions identifying the most essential components to include in handoff.

Your participation is voluntary and you have the right to withdraw at any time without penalty. If you change your mind later while answering the survey, you may simply exit the survey and there will be no negative consequences. You also have the option to skip a question if you do

not feel like answering. Participation will have no effect on your current employment at NorthShore University Health System or University of Illinois at Chicago Hospital and Health Sciences.

Your responses will be completely anonymous and will only be used for this study by the researcher. No IP addresses will be collected. Data will be secured on a password protected computer and deleted upon my completion of the graduate program. Completion and submission of the survey will serve as your voluntary agreement to participate in the study.

Any questions, concerns, complaints, input or for more information about the study, please contact the researcher, Courtney Gibney, at courtks@gmail.com or 616-644-0112 or Dr. Young-Me Lee, at ylee23@depaul.edu or 773-325-4105. If you have questions about your rights as a research subject, you may contact Susan Loess-Perez, DePaul University's Director of Research Compliance, in the Office of Research Services at [312-362-7593](tel:312-362-7593) or by email at sloesspe@depaul.edu. You may also contact DePaul's Office of Research Services if:

- Your questions, concerns, or complaints are not being answered by the research team.
- You cannot reach the research team.
- You want to talk to someone besides the research team.

You may keep this information for your records.

Thank you very much for your consideration and cooperation.

Appendix B

Anesthesia Handoff Survey

This study is being conducted to learn more about handoff between anesthesia providers.

The purpose of my study is to

- 1) to assess the need for a standardized handoff tool for anesthesia providers
- 2) to identify the most essential components of handoff for the development of a handoff tool to be used during the transfer of care between anesthesia providers

The findings will serve as the foundation for the development of a concise, efficient handoff tool to be used during transfer of care between anesthesia providers.

Your participation is voluntary and you have the right to withdraw at any time without penalty. If you change your mind later while answering the survey, you may simply exit the survey without negative consequences. You also have the option to skip a question if you do not feel like answering.

Your responses will be completely anonymous and will only be used for this study by the researcher. Completion and submission of the survey will serve as your voluntary agreement to participate in the study.

Demographic Information

1. What best describes your role?

- | | |
|---------------------------------------------|-------------------------------------------|
| a. Attending Anesthesiologist | f. Anesthesia Fellow |
| b. 1 st year Anesthesia Resident | g. Anesthesia Assistant |
| c. 2 nd year Anesthesia Resident | h. Student Registered Nurse Anesthetist |
| d. 3 rd year Anesthesia Resident | i. Certified Registered Nurse Anesthetist |
| e. 4 th year Anesthesia Resident | |

2. How long have you been providing anesthesia?

- | | | |
|-----------------------|----------------|------------------|
| a. Less than 6 months | d. 6-10 years | h. 26-30 years |
| b. 6 months - 1 year | e. 11-15 years | i. 31-35 years |
| c. 2-5 years | f. 16-20 years | j. Over 35 years |
| | g. 21-25 years | |

3. On average, how many hours per week do you spend providing anesthesia?

- a. Less than 36 hours
 - b. More than 36 hours
4. What is your gender?
- a. Male
 - b. Female
5. What is your ethnic origin?
- a. White
 - b. Black, African, African American
 - c. Asian, Pacific Islander, Native Hawaiian
 - d. Hispanic, Latino, Spanish origin
 - e. American Indian or Alaskan Native

Needs Assessment

6. Do you currently use a systematic process to communicate information during handoff from one anesthesia provider to another for breaks or change of shift?
- a. Yes
 - b. No

If yes, please describe.

7. How often do you feel you are given inadequate information during transfer of care?

Always	Most of the time	Sometimes	Rarely	Never
1	2	3	4	5

8. How often do you feel you give inadequate information during transfer of care?

Always	Most of the time	Sometimes	Rarely	Never
1	2	3	4	5

9. How often do you discover something that wasn't discussed during handoff? (medication administered, change in ventilator settings, missing documentation)

Always	Most of the time	Sometimes	Rarely	Never
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Identify the most essential components of anesthesia handoff

12. How essential are the following components in anesthesia handoff?

	Essential	Very important	Somewhat important	Not very important	Not important
ASA class	1	2	3	4	5
Airway type	1	2	3	4	5
Airway difficulty	1	2	3	4	5
Allergies	1	2	3	4	5
Analgesia	1	2	3	4	5
Antibiotics	1	2	3	4	5
Antiemetics	1	2	3	4	5
Anesthetic type	1	2	3	4	5
Invasive lines (IV, Aline, central line)	1	2	3	4	5
Intake/Output	1	2	3	4	5
Patient medical history	1	2	3	4	5
Patient surgical history	1	2	3	4	5
Position	1	2	3	4	5
Procedure	1	2	3	4	5
NMB status (TOF)	1	2	3	4	5
Surgeon	1	2	3	4	5
Ventilatory status	1	2	3	4	5
Vital signs	1	2	3	4	5

13. Rank the following component from 1 = most essential to 12 = least essential.

- Procedure
- Patient
- Position
- Anesthesia
- Antibiotic
- Airway
- Allergies
- Temperature
- IVs and other invasive line
- ETCO₂ (ventilation)
- Narcotics
- Twitches

Appendix C

Recruitment Email

Dear Anesthesia Provider,

Hello. My name is Courtney Gibney and I am a member of the NorthShore University HealthSystem School of Nurse Anesthesia. I am conducting a research study for my Doctorate of Nursing Practice through DePaul University. I am writing to invite you to participate in my research study about handoff between anesthesia providers.

If you agree to be in this study, you will be asked to complete a survey. You will be provided a link for the survey via email through a secure website

http://depaul.qualtrics.com/SE/?SID=SV_77XiDYeScolcpr7

The link will be available for a limited time and the survey should take about 10 minutes to complete.

Your participation is voluntary and you have the right to withdraw at any time without consequence. If you change your mind later while answering the survey, you may simply exit the survey and there will be no negative consequences.

Your responses will be completely anonymous and will only be used for this study by the researcher. The participant reviewing the information sheet and continuing to the survey will serve as voluntary agreement.

Please see the attached Information Sheet for more information.

Thank you very much.

Sincerely,
Courtney Gibney
courtks@gmail.com
616-644-0112

Appendix D

Figure 1. Conceptual Framework

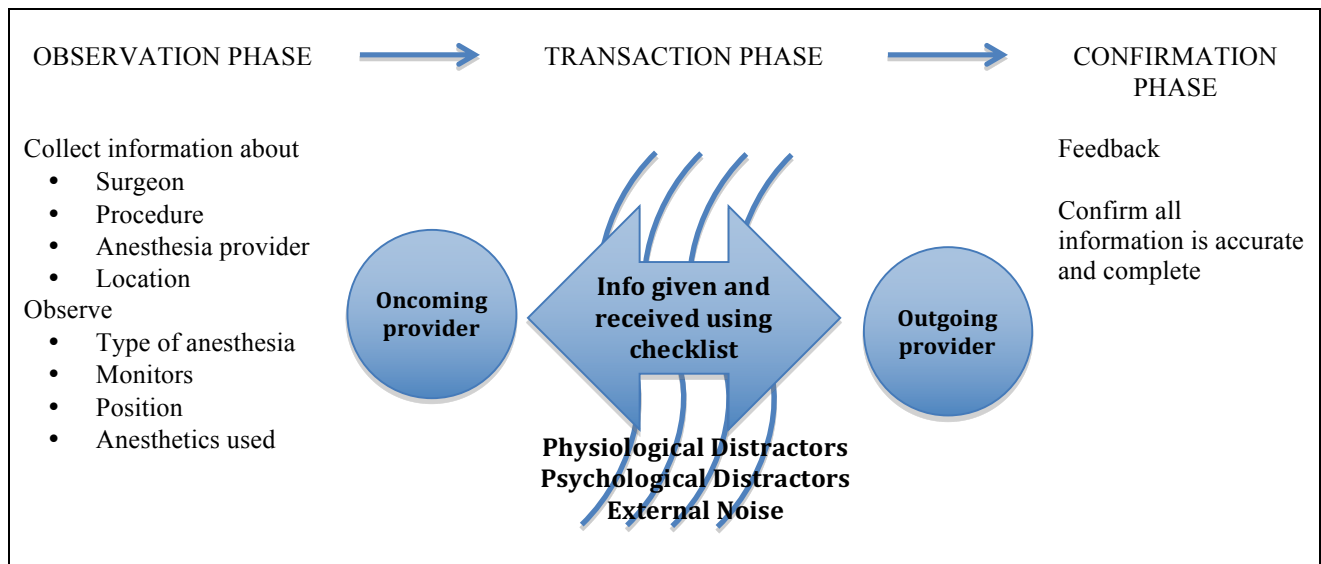
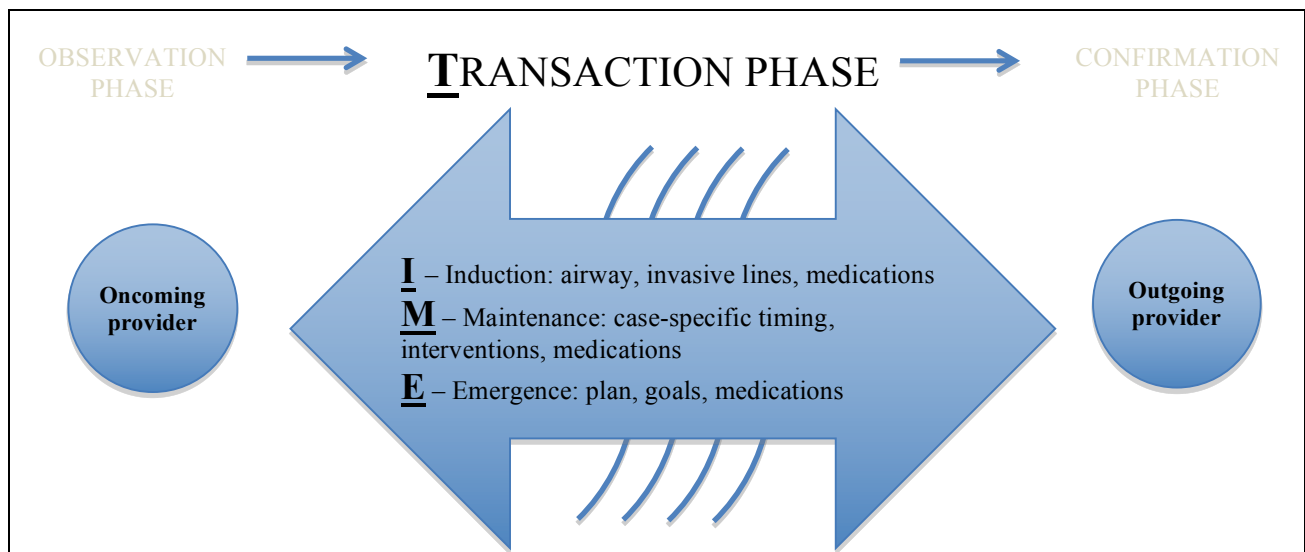


Figure 2. A New Anesthesia Handoff Tool “TIME”



Appendix E



Research Institute

1001 University Place
Evanston, Illinois 60201
www.northshore.org
Phone (224) 364-7100
Fax (847) 570-8011

September 4, 2015

Courtney Gibney, R.N., B.S.
School of Nurse Anesthesia
NorthShore University Health System
Evanston IL 60201

*This letter supersedes letter dated September 2, 2015
to correct the first name of the Principal Investigator.*

Re: EH15-376: Gibney, Courtney R.N., B.S.: A Needs Assessment for the Development of an
Anesthesia Handoff Tool

Dear Ms. Gibney:

The above-referenced project was reviewed in the Research Institute and by a member of the First Friday Institutional Review Board (IRB) of NorthShore University HealthSystem. This project was approved on the date of this letter and has IRB approval through 9/1/2017.

The project was reviewed in accordance with the Code of Federal Regulations (45 CFR 46 - as revised). The NorthShore University HealthSystem Institutional Review Board has an approved assurance of compliance with OHRP which covers this activity (Federal Wide Assurance: FWA00003000). This project conforms to the requirements for Exemption from the Code of Regulations and does not require a Consent form because the research involves the use of anonymous surveys, and the information obtained will be recorded in such a manner that human subjects cannot be identified (45 CFR 46.101b, Category 2).

According to institutional policy, your project must be reviewed **every two years**. A Progress Report Form (RI-5.0) will be **due** in the Research Institute **no later than 45 days prior** to the above expiration date. **Changes in the experimental protocol must not occur without prior approval of the IRB.** Unanticipated problems must be reported to the IRB. If this project is terminated before its next Review, please submit a Termination Report Form (RI-5.1) to the Research Institute.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'D. Merkel'.

Douglas E. Merkel, M.D.
Chairman, Institutional Review Board

/dyc

cc: Jeffery Vender, M.D.
Robert Stanton, J.D.
Julia Feczko, DNP, CRNA

DEPAUL
UNIVERSITY

Office of Research Services
Institutional Review Board
1 East Jackson Boulevard
Chicago, Illinois 60604-2201
312-362-7593
Fax: 312-362-7574

Research Involving Human Subjects

NOTICE OF INSTITUTIONAL REVIEW BOARD ACTION

To: Courtney Gibney, R.N., Graduate Student, School of Nursing

Date: September 4, 2015 (Revised 9/29/2015)

Re: Research Protocol # CG082015NUR
"A needs assessment for the development of an anesthesia handoff tool"

Please review the following important information about the review of your proposed research activity.

Review Details

This submission is an initial submission.

Your research project meets the criteria for Exempt review under 45 CFR 46.101 under the following category:

- (2) *Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:*
- (i) *information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.*

Approval Details

Your research was originally reviewed on August 26, 2015 and revisions were requested. The revisions you submitted on August 31, 2015 were reviewed and approved on September 4, 2015.

Number of approved participants: 100 Total

You should not exceed this total number of subjects without prospectively submitting an amendment to the IRB requesting an increase in subject number.

Funding Source: 1) None.

Approved Performance sites: 1) DePaul University; 2) University of Illinois at Chicago.

Reminders

- Under DePaul's current institutional policy governing human research, research projects that meet the criteria for an exemption determination may receive administrative review by the Office of Research Services Research Protections staff. Once projects are determined to be exempt, the researcher is free

to begin the work and is not required to submit an annual update (continuing review). As your project has been determined to be exempt, your primary obligation moving forward is to resubmit your research materials for review and classification/approval when making changes to the research, but before the changes are implemented in the research. **All changes to the research must be reviewed and approved by the IRB or Office of Research Services staff.** Changes requiring approval include, but are not limited to, changes in the design or focus of the research project, revisions to the information sheet for participants, addition of new measures or instruments, increasing the subject number, and any change to the research that might alter the exemption status (either add additional exemption categories or make the research no longer eligible for an exemption determination).

- **Once the project is complete, you should submit a final closure report to the IRB.**

The Office of Research Services would like to thank you for your efforts and cooperation and wishes you the best of luck on your research. If you have any questions, please contact me by telephone at (312) 362-6168 or via email at jbloom8@depaul.edu.

For the Board,



Jessica Bloom, MPH
Research Protections Coordinator
Office of Research Services

Cc: Young-Me Lee, Ph.D., Faculty, School of Nursing

UNIVERSITY OF ILLINOIS
AT CHICAGO

Office for the Protection of Research Subjects (OPRS)
Office of the Vice Chancellor for Research (MC 672)
203 Administrative Office Building
1737 West Polk Street
Chicago, Illinois 60612-7227

Exemption Granted

September 24, 2015

Randal O. Dull, MD, PhD
Anesthesiology
1740 W. Taylor Street
Suite 3200 West, M/C 515
Chicago, IL 60612
Phone: (312) 996-4020 / Fax: (312) 996-4019

RE: Research Protocol # 2015-0868
“A need assessment for the development of an anesthesia handoff tool”

Sponsors: None

Dear Dr. Dull:

Your Claim of Exemption was reviewed on September 18, 2015 and it was determined that your research meets the criteria for exemption. You may now begin your research.

Exemption Period:	September 18, 2015 – September 18, 2018
Performance Site(s):	UIC
Subject Population:	Adult (18+ years) subjects only
Number of Subjects:	40

The specific exemption category under 45 CFR 46.101(b) is:

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

You are reminded that investigators whose research involving human subjects is determined to be exempt from the federal regulations for the protection of human subjects still have responsibilities for the ethical conduct of the research under state law and UIC policy. Please be aware of the following UIC policies and responsibilities for investigators:

1. Amendments You are responsible for reporting any amendments to your research protocol that may affect the determination of the exemption and may result in your research no longer being eligible for the exemption that has been granted.

Phone: 312-996-1711

<http://www.uic.edu/depts/over/oprs/>

Fax: 312-413-2929

2015-0868

Page 2 of 2

September 24, 2015

2. Record Keeping You are responsible for maintaining a copy all research related records in a secure location in the event future verification is necessary, at a minimum these documents include: the research protocol, the claim of exemption application, all questionnaires, survey instruments, interview questions and/or data collection instruments associated with this research protocol, recruiting or advertising materials, any consent forms or information sheets given to subjects, or any other pertinent documents.
3. Final Report When you have completed work on your research protocol, you should submit a final report to the Office for Protection of Research Subjects (OPRS).
4. Information for Human Subjects UIC Policy requires investigators to provide information about the research protocol to subjects and to obtain their permission prior to their participating in the research. The information about the research protocol should be presented to subjects in writing or orally from a written script. When appropriate, the following information must be provided to all research subjects participating in exempt studies:
 - a. The researchers affiliation; UIC, JBVMAC or other institutions,
 - b. The purpose of the research,
 - c. The extent of the subject's involvement and an explanation of the procedures to be followed,
 - d. Whether the information being collected will be used for any purposes other than the proposed research,
 - e. A description of the procedures to protect the privacy of subjects and the confidentiality of the research information and data,
 - f. Description of any reasonable foreseeable risks,
 - g. Description of anticipated benefit,
 - h. A statement that participation is voluntary and subjects can refuse to participate or can stop at any time,
 - i. A statement that the researcher is available to answer any questions that the subject may have and which includes the name and phone number of the investigator(s).
 - j. A statement that the UIC IRB/OPRS or JBVMAC Patient Advocate Office is available if there are questions about subject's rights, which includes the appropriate phone numbers.

Please be sure to:

→ Use your research protocol number (2015-0868) on any documents or correspondence with the IRB concerning your research protocol.

We wish you the best as you conduct your research. If you have any questions or need further help, please contact the OPRS office at (312) 996-1711 or me at (312) 355-2908. Please send any correspondence about this protocol to OPRS at 203 AOB, M/C 672.

Sincerely,

Charles W. Hoehne
Assistant Director
Office for the Protection of Research Subjects

cc: David Eric Schwartz, Anesthesiology, M/C 515

Appendix F

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM) COURSEWORK REQUIREMENTS REPORT*

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

- **Name:** Courtney Smith (ID: 1258408)
- **Email:** courtks@gmail.com
- **Institution Affiliation:** DePaul University (ID: 1435)
- **Phone:** 616-644-0112

- **Curriculum Group:** Students
- **Course Learner Group:** Students - Class projects
- **Stage:** Stage 1 - Basic Course

- **Report ID:** 16039207
- **Completion Date:** 05/17/2015
- **Expiration Date:** 05/16/2018
- **Minimum Passing:** 80
- **Reported Score*:** 91

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED	SCORE
Students in Research (ID:1321)	05/15/15	8/10 (80%)
History and Ethical Principles - SBE (ID:490)	05/17/15	5/5 (100%)
Defining Research with Human Subjects - SBE (ID:491)	05/17/15	4/5 (80%)
The Federal Regulations - SBE (ID:502)	05/17/15	5/5 (100%)
Assessing Risk - SBE (ID:503)	05/17/15	4/5 (80%)
Informed Consent - SBE (ID:504)	05/17/15	5/5 (100%)
Privacy and Confidentiality - SBE (ID:505)	05/17/15	5/5 (100%)
Conflicts of Interest in Research Involving Human Subjects (ID:488)	05/17/15	5/5 (100%)
DePaul University (ID:12952)	05/17/15	No Quiz

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

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Collaborative Institutional
Training Initiative
at the University of Miami

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)
COURSEWORK TRANSCRIPT REPORT**

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

• **Name:** Courtney Smith (ID: 1258408)
 • **Email:** courtks@gmail.com
 • **Institution Affiliation:** DePaul University (ID: 1435)
 • **Phone:** 616-644-0112

• **Curriculum Group:** Students
 • **Course Learner Group:** Students - Class projects
 • **Stage:** Stage 1 - Basic Course

• **Report ID:** 16039207
 • **Report Date:** 05/17/2015
 • **Current Score**:** 94

REQUIRED, ELECTIVE, AND SUPPLEMENTAL MODULES	MOST RECENT	SCORE
Introduction (ID:757)	05/13/09	No Quiz
Students in Research (ID:1321)	05/15/15	8/10 (80%)
History and Ethical Principles - SBE (ID:490)	05/17/15	5/5 (100%)
Defining Research with Human Subjects - SBE (ID:491)	05/17/15	4/5 (80%)
Records-Based Research (ID:5)	05/14/09	2/2 (100%)
The Federal Regulations - SBE (ID:502)	05/17/15	5/5 (100%)
Assessing Risk - SBE (ID:503)	05/17/15	4/5 (80%)
Informed Consent - SBE (ID:504)	05/17/15	5/5 (100%)
Privacy and Confidentiality - SBE (ID:505)	05/17/15	5/5 (100%)
Research with Prisoners - SBE (ID:506)	05/14/09	4/4 (100%)
Group Harms: Research With Culturally or Medically Vulnerable Groups (ID:11)	05/14/09	3/3 (100%)
Research with Children - SBE (ID:507)	05/14/09	5/5 (100%)
Research in Public Elementary and Secondary Schools - SBE (ID:508)	05/14/09	3/4 (75%)
International Research - SBE (ID:509)	05/14/09	4/4 (100%)
Human Subjects Research at the VA (ID:13)	05/14/09	3/3 (100%)
Internet-Based Research - SBE (ID:510)	05/14/09	5/5 (100%)
Vulnerable Subjects - Research Involving Workers/Employees (ID:483)	05/14/09	4/4 (100%)
Hot Topics (ID:487)	05/14/09	No Quiz
Conflicts of Interest in Research Involving Human Subjects (ID:488)	05/17/15	5/5 (100%)
DePaul University (ID:12952)	05/17/15	No Quiz

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**COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)
COURSEWORK REQUIREMENTS REPORT***

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

- **Name:** Courtney Smith (ID: 1258408)
- **Email:** courtks@gmail.com
- **Institution Affiliation:** NorthShore University HealthSystem Research Institute - Evanston, IL (ID: 1050)
- **Phone:** 6166440112

- **Curriculum Group:** Basic/Refresher Course - Human Subjects Research
- **Course Learner Group:** Biomedical Research
- **Stage:** Stage 1 - Basic Course

- **Report ID:** 16760796
- **Completion Date:** 07/26/2015
- **Expiration Date:** 07/25/2017
- **Minimum Passing:** 80
- **Reported Score*:** 94

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED
Belmont Report and CITI Course Introduction (ID:1127)	07/26/15
History and Ethics of Human Subjects Research (ID:498)	07/26/15
Basic Institutional Review Board (IRB) Regulations and Review Process (ID:2)	07/26/15
Informed Consent (ID:3)	07/26/15
Social and Behavioral Research (SBR) for Biomedical Researchers (ID:4)	07/26/15
Records-Based Research (ID:5)	05/14/09
Genetic Research in Human Populations (ID:6)	07/26/15
Populations in Research Requiring Additional Considerations and/or Protections (ID:16680)	07/26/15
FDA-Regulated Research (ID:12)	07/26/15
Research and HIPAA Privacy Protections (ID:14)	07/26/15
Conflicts of Interest in Research Involving Human Subjects (ID:488)	05/17/15
Avoiding Group Harms - U.S. Research Perspectives (ID:14080)	07/26/15
Recognizing and Reporting Unanticipated Problems Involving Risks to Subjects or Others in Biomedical Research (ID:14777)	07/26/15
NorthShore University HealthSystem (ID:12615)	07/26/15
NorthShore University HealthSystem Research Institute: Roles and Responsibilities of the Research Team (ID:12713)	07/26/15
NorthShore University HealthSystem Research Institute: Forms and Processes (ID:12714)	07/26/15

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**COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)
COURSEWORK TRANSCRIPT REPORT****

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

- **Name:** Courtney Smith (ID: 1258408)
- **Email:** courtks@gmail.com
- **Institution Affiliation:** NorthShore University HealthSystem Research Institute - Evanston, IL (ID: 1050)
- **Phone:** 6166440112

- **Curriculum Group:** Basic/Refresher Course - Human Subjects Research
- **Course Learner Group:** Biomedical Research
- **Stage:** Stage 1 - Basic Course

- **Report ID:** 16760796
- **Report Date:** 07/26/2015
- **Current Score**:** 98

REQUIRED, ELECTIVE, AND SUPPLEMENTAL MODULES	MOST RECENT
History and Ethics of Human Subjects Research (ID:498)	07/26/15
Introduction (ID:757)	05/13/09
Informed Consent (ID:3)	07/26/15
Social and Behavioral Research (SBR) for Biomedical Researchers (ID:4)	07/26/15
Belmont Report and CITI Course Introduction (ID:1127)	07/26/15
Records-Based Research (ID:5)	05/14/09
Genetic Research in Human Populations (ID:6)	07/26/15
Group Harms: Research With Culturally or Medically Vulnerable Groups (ID:11)	05/14/09
FDA-Regulated Research (ID:12)	07/26/15
Human Subjects Research at the VA (ID:13)	05/14/09
Research and HIPAA Privacy Protections (ID:14)	07/26/15
Vulnerable Subjects - Research Involving Workers/Employees (ID:483)	05/14/09
Hot Topics (ID:487)	05/14/09
Conflicts of Interest in Research Involving Human Subjects (ID:488)	05/17/15
NorthShore University HealthSystem (ID:12615)	07/26/15
NorthShore University HealthSystem Research Institute: Roles and Responsibilities of the Research Team (ID:12713)	07/26/15
NorthShore University HealthSystem Research Institute: Forms and Processes (ID:12714)	07/26/15
Avoiding Group Harms - U.S. Research Perspectives (ID:14080)	07/26/15
Basic Institutional Review Board (IRB) Regulations and Review Process (ID:2)	07/26/15
Recognizing and Reporting Unanticipated Problems Involving Risks to Subjects or Others in Biomedical Research (ID:14777)	07/26/15
Populations in Research Requiring Additional Considerations and/or Protections (ID:16680)	07/26/15

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Appendix G

Evidenced-Based Synthesis Table

Reference	Study Design	Data Collection	Analysis	Conclusions
Abraham, J., Kannampallil, T. G., Almoosa, K. F., Patel, B., & Patel, V. L. (2014). Comparative evaluation of the content and structure of communication using two handoff tools: implications for patient safety. <i>Journal of Critical Care</i> , 29(2), 311-e1.	Nonrandomized pre-post prospective intervention. Semi-experimental.	Audio recordings of communication events (CE); breakdowns	Qualitative analysis was complemented with exploratory sequential pattern analysis techniques. T-tests and analysis of variance.	HAND-IT led to fewer communication breakdowns ($F_{1,80} = 45.66$; $P < .0001$), greater number of CEs ($t_{40} = 4.56$; $P < .001$), with more ideal CEs than Subjective, Objective, Assessment and Plan ($t_{40} = 9.27$; $P < .001$). HAND-IT was characterized by more request-response CE transitions.
Amato-Vealey, E., Barba, M., & Vealey, R. (2008). Hand-off communication: a requisite for perioperative patient safety. <i>Association of periOperative Registered Nurses Journal</i> , 88(5), 763-774. doi:10.1016/j.aorn.2008.07.022	Descriptive case-study. Proposal of handoff tools for perioperative process			
Arora, V., & Johnson, J. (2006). A model for building a standardized hand-off protocol. <i>Joint Commission Journal on Quality and Patient Safety</i> , 32(11), 646-655.	Descriptive. Process analysis by observation and workshop with interviews.	Observations and interview results	Standardize process of handoff using process mapping, create a checklist, plan to train.	The standardized protocol for handoffs needs to be tailored to discipline and organization. Standardization is the core goal for both hand-off process and content.
Beaumont, K., & Russell, J. (2012). Standardising for reliability: the contribution of tools and checklists. <i>Nursing Standard</i> , 26(34), 35–39.	Descriptive.	Describes two patient safety initiatives using checklists		Standardization using checklists and tools can increase reliability and improve outcomes in healthcare.
Dharmadasa, A., Bailes, I., Gough, K., Ebrahimi, N., Robinson, P. N., & Lucas, D. N. (2014). An audit of the efficacy of a structured handover tool in obstetric anaesthesia. <i>International Journal Of Obstetric Anesthesia</i> , 23(2), 151-156. doi:10.1016/j.ijoa.2013.12.002	Correlational, observational. Two audit cycles of anesthesia handovers. Data collection before SAFE, after SAFE, 15 months later, re-education/reintroduction	Increase in number of obstetric patients handed over after implementation of the SAFE tool.	Chi-squared and Fisher's exact test.	Patients were 4x more likely to be handed over with tool.
Durso, F. T., Crutchfield, J. M., & Harvey, C. M. (2007). The cooperative shift change: an illustration using air traffic control. <i>Theoretical Issues in Ergonomics Science</i> , 8(3), 213–232. http://doi.org/10.1080/14639220600816155	Correlational, observational	Observed cooperative shift changes at air traffic control centers.	Descriptive statistics, ANOVA	When one operator passes information along with responsibility to an operator charged with replacing her, a particular kind of coordination, a cooperative shift change has occurred consisting of end-of-shift, arrival, meeting, and taking post phases.
Fudickar, A., Hörle, K., Wiltfang, J., & Bein, B. (2012). The effect of the WHO surgical	Literature review.	PubMed and Medline database searches for	Descriptive.	The two surgical outcome studies had improvement of perioperative mortality by 47% in one study and by 62% in the other, as well as a relative

safety checklist on complication rate and communication. <i>Deutsches Ärzteblatt International</i> , 109(42), 695.		“surgical safety checklist” before February 2012.		improvement of perioperative morbidity by 36% in one study and by 37% in the other. Improved interdisciplinary communication was also found.
Hagerman, N., Varughese, A., Dean Kurth, C. (2014). Quality and safety in pediatric anesthesia: how can guidelines, checklists, and initiatives improve the outcome? <i>Current Opinion Anesthesiology</i> , 27(3), 323-329.	Literature review, descriptive.	Describes recent advancements in quality improvement for pediatric anesthesiology.	Quality improvement, specifically the use of checklists improves adherence to evidence-based care in crisis situations, decreases catheter-associated bloodstream infections, reduces blood product utilization, and improves communication during the patient handoff process	Quality initiatives and cognitive aids help improve job performance and better patient experience and outcomes, reducing intraoperative and postoperative complications and mortality.
Haynes, A. B., Weiser, T. G., Berry, W. R., Lipsitz, S. R., Breizat, A.-H. S., Dellinger, E. P. ... Gawande, A. A. (2009). A surgical safety checklist to reduce morbidity and mortality in a global population. <i>New England Journal of Medicine</i> , 360(5), 491–499.	Prospective study pre-intervention and post-intervention	Two-step checklist-implementation program	Logistic regression analysis, descriptive statistics, cross-validation	The rate of death was 1.5% before the checklist was introduced and 0.8% afterward (P = 0.003). Inpatient complications occurred in 11.0% of patients at baseline and in 7.0% after introduction of the checklist (P<0.001).
Horwitz, L. I., Moin, T., & Green, M. L. (2007). Development and implementation of an oral sign-out skills curriculum. <i>Journal of General Internal Medicine</i> , 22(10), 1470–1474. doi:10.1007/s11606-007-0331-0	Correlational. Sign-out curriculum.	Evaluation of course.	Paired t-test.	The mean score was 4.44±0.61 on a 1–5 scale. Perceived usefulness of the structured oral communication format was 4.46 ± 0.78. Participants rated their comfort with providing oral sign-out significantly higher after the session than before (3.27±1.0 before vs. 3.94±0.90 after; p<.001).
Jayaswal, S., Berry, L., Leopold, R., Hart, S., Scuderi-Porter, H., DiGiovanni, N., Phillips, A. (2011). Evaluating safety of handoffs between anesthesia care providers. <i>The Ochsner Journal</i> 11:99–101.	Descriptive.	Survey.	Descriptive statistics.	20% found the existing handoff process inadequate. 84% reported giving and 57% reported receiving a poor or incomplete handoff within the previous year, 25% related an adverse outcome to a poor handoff; 89%, felt that standardization of this process could improve patient care; 68% reported that ideal handoffs would occur in the record and in person; 62% believed that handoffs should be incorporated into the electronic medical record.
Joint Commission on Accreditation of Healthcare Organizations. (2012). Joint commission center for transforming healthcare releases targeted solutions tool for hand-off communications. <i>Joint Commission Perspectives</i> , 32(8): 1-3.	Descriptive.	Proposal of SHARE tool.		Purpose is to avoid communication-related miscues and errors during transfer of care.
Kalkman, Cor J. (2010). Handover in the perioperative care process. <i>Current Opinion in Anaesthesiology</i> , 23(6) (2010): 749-53.	Literature review.		Editorial.	Robust, structured handover processes are critical for safe patient care. Handover improvements will need to be tailored to the specific care setting and handover type.

Leonard, M. (2004). The human factor: the critical importance of effective teamwork and communication in providing safe care. <i>Quality and Safety in Health Care</i> , 13(suppl_1), i85–i90. http://doi.org/10.1136/qshc.2004.010033	Descriptive	Patient safety implementation of standardized tools (SBAR) and behaviors.	Descriptive	Surgical briefings, properties of high reliability perinatal care, the value of critical event training and simulation, and benefits of a standardised communication process in the care of patients transferred from hospitals to skilled nursing facilities using SBAR are described.
Manser, T. (2011). Minding the gaps: moving handover research forward. <i>European Journal Of Anaesthesiology</i> , 28(9), 613-615.	Literature review.		Editorial.	Protocols need to be adapted to the specifics of the clinical context. Setting-specific adaptations that are negotiated among all parties involved are necessary. Information transfer, shared understanding and working atmosphere predict handover quality.
Manser, T., & Foster, S. (2011). Effective handover communication: an overview of research and improvement efforts. <i>Best Practice & Research Clinical Anaesthesiology</i> , 25(2), 181-191.	Literature review.			There is abundant evidence regarding the negative consequences of poor communication at patient handover in health-care. Organizational, cultural, behavioural and environmental factors have been found to undermine the effectiveness of intra- and inter-professional communication across a variety of health-care settings. There is a lack of formal education in patient handover at all levels. Improvement efforts focus on the standardisation of handover processes and communication, technological support for handover and improved teamwork across care transitions.
Manser, T., Foster, S., Flin, R., & Patey, R. (2013). Team communication during patient handover from the operating room: more than facts and figures. <i>Human Factors</i> , 55(1), 138-156.	Prospective, cross-sectional observation	Observed postoperative handover. Handover assessment tool to rate satisfaction.	MANOV, ANOVA, F test of the equality of two variances, Pearson correlations	Significantly different patterns of handover communication between clinical settings and across handover roles. Assessment was associated with higher ratings of overall handover quality by the receiving clinicians and correlated with all four dimensions of handover quality (pt care info, handover org, shared understanding, conduct).
Pancieri, A. P., Santos, B. P., Avila, M. A. G. D., & Braga, E. M. (2013). Safe surgery checklist: analysis of the safety and communication of teams from a teaching hospital. <i>Revista Gaúcha de Enfermagem</i> , 34(1), 71-78.	Descriptive, analytical, qualitative field	Evaluate opinions on influence of its application on the safety of the surgical process and on interpersonal communication	Bardin's Content Analysis Method	The subjects did not notice any changes in their interpersonal communication when using the checklist; however, they gave suggestions and reported that its use provided greater safety to the procedure.
Petrovic, M. A., Aboumatar, H., Scholl, A. T., Gill, R. S., Krenzischek, D. A., Camp, M. S., & ... Martinez, E. A. (2015). The perioperative handoff protocol: evaluating impacts on handoff defects and provider satisfaction in adult perianesthesia care units. <i>Journal Of Clinical Anesthesia</i> , 27(2), 111-119. doi:10.1016/j.jclinane.2014.09.007	Prospective, unblinded cross-sectional	Pre and post perioperative handoff protocol implementation observations. Perioperative handoff survey.	Descriptive statistics, 2-sample t test and Mann-Whitney U test, Fisher exact test	The mean number of defects per handoff decreased from 9.92 to 3.68 (P b .01). The mean number of missed information items from the surgery report decreased from 7.57 to 1.2 items per handoff and from 2.02 to 0.94 (P b .01) for the anesthesia report.
Pezzolesi, C., Manser, T., Schifano, F., Kostrzewski, A., Pickles, J., Harriet, N., & ... Dhillon, S. (2013). Human factors in clinical handover:	Literature Review and Delphi process	Develop and test handover performance tool.	Kaiser-Meyer-Olkin (KMO) Initial principle components analysis was conducted on the	Communication, teamwork and situation awareness explained, respectively, 55.5, 47.2 and 39.6% of the variance in doctors rating of quality. Internal consistency and inter-rater reliability of the HPT

development and testing of a 'handover performance tool' for doctors' shift handovers. <i>International Journal For Quality In Health Care</i> , 25(1), 58-65. doi:10.1093/intqhc/mzs076			polychoric correlation matrix; Multiple regression analysis	were good (Cronbach's alpha = 0.77 and intra-class correlation = 0.817).
Saager, L., Hesler, B., You, J., Turan, A., Mascha, E., Sessler, D., Kurz, A. (2014). Intraoperative transitions of anesthesia care and postoperative adverse outcomes. <i>Anesthesiology</i> , 10(121), 695-706. doi:10.1097/ALN.0000000000000401	Retrospective analyses	Chart review to assess association of anesthesia handovers and in-hospital morbidity and mortality.	Multivariable logistic regression	Anesthesia care transitions were significantly associated with higher odds of experiencing any major in-hospital mortality/morbidity (incidence of 8.8, 11.6, 14.2, 17.0, and 21.2% for patients with 0, 1, 2, 3, and ≥ 4 transitions; odds ratio 1.08 [95% CI, 1.05 to 1.10] for an increase of 1 transition category, $P < 0.001$). Care transitions among attending anesthesiologists and residents or nurse anesthetists were similarly associated with harm (odds ratio 1.07 [98.3% CI, 1.03 to 1.12] for attending [incidence of 9.4, 13.9, 17.4, and 21.5% for patients with 0, 1, 2, and ≥ 3 transitions] and 1.07 [1.04 to 1.11] for residents or nurses [incidence of 9.4, 13.0, 15.4, and 21.2% for patients with 0, 1, 2, and ≥ 3 transitions], both $P < 0.001$). There was no difference between matched resident only (8.5%) and nurse anesthetist only (8.8%) cases on the collapsed composite outcome (odds ratio, 1.00 [98.3%, 0.93 to 1.07]; $P = 0.92$).
Starmer, A. J., Sectish, T. C., Simon, D. W., Keohane, C., McSweeney, M. E., Chung, E. Y., & ... Landrigan, C. P. (2013). Rates of medical errors and preventable adverse events among hospitalized children following implementation of a resident handoff bundle. <i>JAMA: Journal of the American Medical Association</i> , 310(21), 2262-2270. doi:10.1001/jama.2013.281961	Prospective intervention	Resident handoff bundle: standardized communication and handoff training, verbal mnemonic, team handoff structure	Pearson χ^2 , Wilcoxon rank sum, Poisson regression, z test,	Implementation of a resident handoff bundle was associated with a significant reduction in medical errors and preventable adverse events.
Salzwedel, C., Bartz, H., Kühnelt, I., Appel, D., Haupt, O., Maisch, S., & Schmidt, G. N. (2013). The effect of a checklist on the quality of post-anaesthesia patient handover: a randomized controlled trial. <i>International Journal For Quality In Health Care</i> , 25(2), 176-181. doi:10.1093/intqhc/mzt009	Quasi-experimental	Pre and post handover checklist prospective trial.	Mann-Whitney test., chi-square test.	Checklist led to significant increase in items handed over from median of 32.4–48.7%. The duration of handover increased from a median of 86–121 s. Instructions about items that should be included in handovers, but without the use of a written checklist, was not associated with an increase in the number of items handed over or duration of the interview.
Tapia, N., Fallon, S., Brandt, M., Scott, B., Suliburk, J. (2013). Assessment and standardization of resident handoff practices: PACT project. <i>Journal of Surgical Research</i> , 184(1), 71-77. doi: 10.1016/j.jss.2013.04.063.	Prospective, observational, descriptive	Focus groups and development of direct observation handoff analysis tool	Descriptive statistics	The majority of handoffs were unstructured, junior residents had a 58% rate of incompleteness of the assigned tasks and 54% incidence of being unable to answer a key patient status question.
Wayne, J. D., Tyagi, R., Reinhardt, G., Rooney, D., Makoul, G., Chopra, S., &	Descriptive	Focus groups and pre and post standardized,	descriptive statistics, the Student t-test, and multivariate analysis.	Residents reported increased accuracy, as measured by the perceived number of inaccuracies found on sign-out sheets (p 0.003). Improved completeness

DaRosa, D. A. (2008). Simple standardized patient handoff system that increases accuracy and completeness. <i>Journal of Surgical Education</i> , 65(6), 476-485.		partially automated, handoff form surveys		of the information on sign-out sheets ($p = 0.015$). Improved clarity on time of transfer of care from outgoing to incoming ($p = 0.0001$). The type of rotation showed improvement (confidence interval 99%). Perceived number of inappropriate tasks transferred decreased significantly. Experience and type of rotation did not affect these measures.
World Health Organization (2008) <i>Safe Surgery Saves Lives: The Second Global Patient Safety Challenge</i> . Retrieved from www.who.int/patientsafety/safesurgery/en				
Wright, S. M. (2013). Examining transfer of care processes in nurse anesthesia practice: introducing the PATIENT protocol. <i>American Association of Nurse Anesthetists Journal</i> , 81(3), 225-232.	Non experimental exploratory	Survey, checklist implementation evaluation.	Descriptive statistics	The content of transfer of responsibility event (TRE) in anesthesia appears to be loosely defined, and the goal of the transfer of care process may not be well substantiated across the discipline. A change in current transfer of care processes may be met with resistance from some practitioners.

Appendix H**TIME Handoff Tool**

T	<i>TRANSACTION</i>	Observations: surgeon, procedure, position, monitors, anesthetic Patient: history, allergies
I	<i>INDUCTION</i>	Airway, invasive lines, medications
M	<i>MAINTENANCE</i>	Case-specifics: timing, interventions, medications
E	<i>EMERGENCE</i>	Plan, goals, medications

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- Abraham, J., Kannampallil, T. G., Almoosa, K. F., Patel, B., & Patel, V. L. (2014). Comparative evaluation of the content and structure of communication using two handoff tools: Implications for patient safety. *Journal of Critical Care, 29*(2), 311.e1-e7.
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- Dharmadasa, A., Bailes, I., Gough, K., Ebrahimi, N., Robinson, P. N., & Lucas, D. N. (2014). An audit of the efficacy of a structured handover tool in obstetric anaesthesia. *International Journal of Obstetric Anesthesia, 23*(2), 151-156. doi:10.1016/j.ijoa.2013.12.002
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