

**Implementation of a Standardized Handoff Report for Nurse Anesthetists in the Intra-
Operative Setting: A Quality Improvement Project**

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Notes from the Author

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Abstract

The anesthetic period is a dynamic moment in patient care, and the role of anesthesia providers during anesthesia handoff carries a tremendous amount of responsibility. The operating room environment offers an additional layer of complexity and distractions during anesthesia handoff. The purpose of this Doctor of Nursing Practice project was to assess anesthesia providers' perceptions of adequacy of the PATIENT mnemonic to facilitate standardized handoffs of anesthetized patients. The goal was to gain a better understanding of CRNA perceptions of this method in order to assess its usefulness as a handoff checklist in the transfer of care. This quality improvement project was conducted in the operating rooms of an outpatient surgery center located in the southeastern region of the United States. A pre-and post-survey design was used to complete a single plan, do, study, act cycle to assess perceptions of a standardized anesthesia handoff checklist among a nonrandomized convenience sample of CRNAs who volunteered to participate in the project. The CRNAs reported in the post-implementation survey that the PATIENT mnemonic was easy to use but not more efficient, comprehensive, or appropriate in length compared to their personally used handoff methods. There was a net neutral response regarding whether the tool was more time consuming, lent itself to errors, and overall satisfaction using the mnemonic. Limitations included a small sample size and number of survey responses. Recommendations for future study involve CRNA collaboration in the creation of an anesthesia handoff checklist as well as anesthesia handoff project champions.

Keywords: anesthesia, handoff, standardized, checklist, CRNA

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Section I. Introduction

Background

Intraoperative anesthesia handoff is the transition of patient care between two licensed anesthesia providers. According to Hu et al. (2020), this transfer of information, liability, and responsibility may be temporary or permanent. Lazzara et al. (2020) define three distinct transfer of care categories: the first is change of shift, the second is relief of duty, typically less than thirty minutes, and the third is transition in care, such as transfer to the post-anesthesia care unit (PACU) or intensive care unit (ICU). The handoff report includes health information that is patient and case specific and ideally is a concise but thorough reflection of the patient's history, medications, and anesthesia care plan. Current practice suggests that anesthesia handoff is often brief and informal, which may provide an opportunity for error related to omitted or unclear information. To improve practice, researchers have developed standardized handoff tools, often in the form of a mnemonic, to provide a structured approach to anesthesia handoff. However, Allen et al. (2023) found that 81.2% of certified registered nurse anesthetists (CRNAs) do not use a standardized anesthesia handoff tool, and 83% of the same study's participants reported their facility did not provide them with a standardized handoff tool. In addition, it has been demonstrated that poor communication contributes to greater than 70% of medical errors (Canale, 2018). Hu et al. (2020) identified the possible adverse outcomes of inadequate handover to include increased length of hospital stay, increased morbidity, and potential mortality.

The anesthetic period is a volatile and dynamic moment in patient care. While under the influence of general anesthesia, a patient cannot advocate for themselves, control their airway or breathing, autonomically compensate, or respond to pain. Patient responses to anesthesia may vary, and a patient's medical history plays an essential role in determining anesthesia care. The

role of anesthesia providers during the handoff period carries a tremendous amount of responsibility, and every handover must be complete and factual to allow the receiving anesthesia provider to continue care without gaps or inconsistencies.

The operating room (OR) environment offers an additional layer of complexity during anesthesia handoff. Alarms, conversation, surgical machinery, and a variety of lights and sounds compete for the attention of both receiving and sending anesthesia providers. Mershon et al. (2021) explain that it is not uncommon for patient emergencies requiring immediate intervention to interrupt the flow of communication. This halts the natural process of information transfer and can serve as a distraction, and thus contribute to omission of patient information. Additional factors often correlated to a lack of complete intraoperative anesthesia communication include differences in training, clinician experience, and the point in the surgery. A handoff that occurs just before induction of the patient may differ in detail and length when compared to report given just prior to emergence.

While the American Association of Nurse Anesthesiology (AANA) does not have published guidelines on this topic, the organization has published numerous articles supporting standardized handoffs for CRNAs in all practice areas. A search of the AANA journals using the key term “handover” reveals seven articles published from 2013 to 2023 that provide support for standardized handoff. These journal articles examine the use of handover tools such as Wright’s (2013) PATIENT mnemonic, the TIME Anesthesia Handoff Tool by Gibney et al. (2017), the WHAT tool by Lambert and Adams (2018), and the SAFE OB handover published by Gabot et al. (2022). These tools share common elements for provider communication including current patient interventions as well as future concerns. Gabot et al. (2022) explained that standardized anesthesia handover offers an opportunity for improved situational awareness as two highly

trained professionals review case specific patient information and verify findings together.

Standardized anesthesia handovers are a cost-effective and sustainable strategy to improve the quality of information transfer and impact CRNA perceptions of patient safety.

Organizational Needs Statement

The participating facility does not currently require a standardized CRNA intraoperative handover. As an outpatient surgery center serving 29 counties in eastern North Carolina, this facility performs many successful surgeries each day and provides care to a high acuity population with excellent patient outcomes. However, the surgical environment is stimulating and demanding with a high surgical turnover rate as well as constant noise from machines, alarms, and conversations. In this setting, CRNAs hold a high degree of responsibility that is coupled with an equivalent risk for error. Given the demand for care and volume of patients, a concise but thorough transfer of information is essential during intraoperative anesthesia handoff. Studies have demonstrated that standardized communication improves employee satisfaction and perceptions of patient safety (Canale, 2018). Standardized intraoperative handover also aligns with the AANA's goal of improving patient care and advancing the nurse anesthesiology profession. A standardized intraoperative anesthesia handoff tool cognitively prompts providers to include important patient information which increases confidence in the validity and completeness of handoff.

Problem Statement

The Joint Commission reported that 70% of sentinel events are caused by incomplete communication, with approximately half of those breakdowns occurring during patient handoff reports (Canale, 2018). In response to the frequency of these reported events, The Joint Commission recommended implementing standardized processes in patient handoff communications. While individual anesthesia providers often use systematic methods for giving report, anesthesia departments typically do not use common reporting tools, which may improve the quality and continuity of information, perception of patient safety, and healthcare worker satisfaction.

Purpose Statement

The purpose of this Doctor of Nursing Practice (DNP) project was to assess anesthesia providers' perceptions of adequacy of the PATIENT mnemonic to facilitate standardized handoffs of anesthetized patients. The goal was to gain a better understanding of CRNA perceptions of this method in order to assess its usefulness as a handoff checklist in the transfer of care. It was anticipated that knowledge gained from this project could be used in future quality improvement and policy efforts aimed at improving intraoperative communication between providers through standardization of the handoff process at this facility.

Section II. Evidence

Description of Search Strategies

The purpose of this literature review was to examine current evidence and practice recommendations surrounding anesthesia intraoperative handoff and the use of standardized tools to facilitate communication. The PICOT question used to guide search strategies was, “In the operating room, how does a standardized communication handoff tool for CRNAs affect provider satisfaction and perceptions of patient safety when compared to the current practice of individualized handoff?”

The databases PubMed and Cumulative Index to Nursing and Allied Health Literature (CINAHL) and the search engine Google Scholar were used to identify current evidence regarding practice recommendations for intraoperative anesthesia handoff as well as their impact on patient outcomes. Boolean operators were used to combine keywords and concepts. To identify current evidence related to this project in PubMed, the author used the search strategy “(intraoperative) AND ((anesthesia) OR (anesthetists)) AND (handoff OR (transfer care)).” This search provided the medical subject heading (MeSH) terms “anesthesia” and “anesthetists.” Limits applied included dates ranging from the years 2018 to 2023 and articles in the English language. In CINAHL, the author used the search, “((MH "Hand Off (Patient Safety)") OR "handoff") AND ((MH "Certified Registered Nurse Anesthetists") OR (MH "Anesthetists") OR "nurse anesthetist"))” and applied the limits of dates ranging from the years 2018 to 2023, English language, and academic journals. In the search engine Google Scholar, the author employed a similar approach as PubMed with the search, “(intraoperative) AND (anesthesia) OR (anesthetists) AND (handoff OR (transfer care)),” and limited the dates to articles published between 2018 and 2023. Details of concepts, keywords, MeSH terms, and concept headings can

be found in Appendix A. Appendix B provides details regarding search strategies, applied limits, number of citations found and kept, and rationale for inclusion or exclusion of the items. AANA practice recommendations were examined by searching the AANA website with the author's applied membership for keywords "intraoperative" and "handoff" to provide publications by the leading organization supporting nurse anesthetists.

Articles were reviewed for inclusion based on title and abstract content. Content kept for review included evidence regarding intraoperative anesthesia handoff and its impact on patient morbidity and mortality, research surrounding the use of standardized checklists for handoff, and incorporation of standardized checklists into the electronic health record (EHR). The specific PubMed search returned a total of 100 articles, of which 21 were kept for a full-text review. The search strategy applied to CINAHL returned a total of 23 articles, of which five were kept for a full-text review. Lastly, the search strategy applied to Google Scholar produced 17,000 results of which ten pages were reviewed, and 22 articles were kept for a full-text review. A final total of 19 articles were included to inform this DNP project.

Melnyk & Fineout-Overholt (2019) created a hierarchy that organizes current evidence for quality improvement (QI), interventions, and evidence-based practice (EBP) projects into systematic levels. The articles included after full-text review are categorized based on these levels of evidence. Three systematic reviews and/or meta-analyses of current literature articles (Level I), one randomized control trial (RCT) (Level II), three non-randomized control trials (Level III), two controlled cohort/correlational design studies (Level IV), and ten qualitative/descriptive design studies (Level VI) were reviewed (Appendix C).

Selected Literature Synthesis

To synthesize current literature surrounding the use of standardized intraoperative anesthesia handoff tools, it is important to first examine the relationship between intraoperative handoff and patient outcomes. While nearly all 19 sources included in this literature synthesis cited The Joint Commission's findings regarding miscommunication and increased patient risk, five articles specifically addressed the relationship between anesthesia handoff and patient morbidity and mortality: Three systematic reviews and meta-analyses (Abraham et al., 2021; Boet et al., 2020; & Hu et al., 2020), an observational study (Jurewicz et al., 2018), and a retrospective controlled cohort study (Jones et al., 2018). These sources determined that anesthesia intraoperative handoff is associated with significantly increased patient risk.

According to the systematic analysis by Boet et al. (2020), risk for adverse events is increased by as much as 40% when anesthesia handoff occurs during the intraoperative period. Adverse events correlated to intraoperative anesthesia handover may be as severe as an increased risk of inpatient mortality, major morbidity, postoperative complications, admission to an ICU, increased length of hospital stay, extended postoperative mechanical ventilation, wound dehiscence, bleeding, pneumonia, emergent return to the OR, new onset hemodialysis, and postoperative delirium. In their systematic review and meta-analysis, Hu et al. (2020) revealed similar findings, reporting that each additional anesthesia handoff increased a patient's risk of morbidity by 20%. In the systematic review and meta-analysis by Abraham et al. (2021), seven of the eight retrospective studies reported a positive association between intraoperative handoffs and adverse clinical outcomes. An observational study by Jurewicz et al. (2018) and a retrospective cohort study conducted by Jones et al. (2018) support the negative relationship between anesthesia handoff and increased risk of morbidity and mortality.

To provide a comprehensive examination of current literature, it is also worth noting the conflicting evidence regarding anesthesia handoff and its impact on patient outcomes. Three of the nineteen reviewed articles (Kannampallil et al., 2021; Meersch et al., 2022; O'Reilly-Shah et al., 2019) found no statistically significant evidence supporting the relationship between intraoperative anesthesia handoff and adverse patient events. A randomized control trial of 1,772 patients published by Meersch et al. (2022) found no significant difference between patients who received intraoperative anesthesia handoff and patients who did not, with 268 events (30.1%) in the handoff group and 284 (32.5%) in the no handoff group. The authors of this study determined that standardization of intraoperative anesthesia handoff would not significantly improve patient outcomes as there was no statistical significance between the control group and handoff group.

Likewise, in an observational study specific to pediatric surgical patients, Kannampallil et al. (2021) found no correlation between negative postoperative outcomes within a 30-day period and intraoperative anesthesia handoff in their population of 5,411 patients. O'Reilly-Shah et al. (2019) acknowledged this conflicting evidence in current literature and attributed it to differences in care models or analytic approaches to confounding variables. Their retrospective cohort study found that when statistically examined as single variables, attending anesthesiologist handoffs, as well as handoffs for complete transition of care, were associated with higher rates of adverse outcomes. However, once confounding variables were included in the statistical analysis, the presence of an attending handover and complete transition of care were not statistically significant. Confounding variables examined included the presence of an attending anesthesiologist, nurse anesthetist, or resident; patient age; sex; body mass index; ASA-PS (American Society of Anesthesiologists Physical Status); surgical case complexity; case length; and evening/weekend start time.

Though it is important to acknowledge their contribution to current literature regarding the impact of anesthesia handoff on patient outcomes, these conflicting studies (Kannampallil et al., 2021; Meersch et al., 2022; O'Reilly-Shah et al., 2019) do have their limitations. All three previously mentioned studies have relatively small sample sizes and are categorized as level VI, II, and IV evidence, respectively, according to Melnyk and Fineout-Overholt's systematic levels of evidence (2019). Though compelling, their contribution to current literature is not weighted as significantly as the large powered systematic reviews and meta-analyses that support the relationship between intraoperative anesthesia handoff and adverse patient outcomes.

Nine of the 19 articles included in this review examined the use of standardized intraoperative anesthesia handoff tools. Included are one systematic review and meta-analysis (Abraham et al., 2021); two non-randomized control trials (Lee et al., 2018; Schiavi et al., 2023); one qualitative/descriptive design study (Mershon et al., 2021); and five quality improvement/evidence-based practice studies (Canale, 2018; Gabot et al., 2022; Lane et al., 2022; Silva et al., 2019; Wright, 2013). Abraham et al. (2021) reported, in their systematic review and meta-analysis, that six of their included studies used a nonrandomized prospective design to examine the impact of anesthesia handoff tools on provider satisfaction, information transfer, length of handoff, and adherence. All six studies provided evidence to support the use of anesthesia intraoperative handoff tools as they improved outcomes related to effective communication (increased retention of patient data, mutual communication), efficiency (length of handoff), incorporation into practice, and provider satisfaction.

Additional common themes in the literature surrounding incorporation of standardized anesthesia handoff included improved completeness of patient information, quality of information transfer, efficiency, perception of safety, and employee satisfaction. A variety of

standardized anesthesia tools were used in these studies. Schiavi et al. (2023), Mershon et al. (2021), and Lee et al. (2018) incorporated anesthesia handoff checklists into the EHR. Lane et al. (2022) and Silva et al. (2019) created facility specific checklists to improve transfer of patient information, while Gabot et al. (2022), Canale (2018), and Wright (2013) relied on the use of mnemonics to facilitate recall, including SAFE OB and PATIENT.

Articles addressing perceived barriers to the incorporation of standardized anesthesia handoff were also included in the review of literature. A qualitative/descriptive design published by Allen et al. (2023) found that the top three barriers to using a standardized anesthesia handoff were that they were not standard of care, they increased the time spent giving handoff, and lack of reception/interest/noncompliance by the receiving anesthesia provider. Additional identified barriers included feeling rushed by the surgeon or relieving anesthesia provider, missing information from standardized tools, or too much information in the standardized handoff tool. Similarly, Gabot et al. (2022) and Canale (2018) identified practice barriers to include a need for frequent updates to the tool and increased length of report time, respectively.

Additional articles that offered supplemental data regarding anesthesia handoff were included in the literature review. Vladinov et al. (2020) discussed the creation of the AneSBAR rubric for evaluation of SRNA (student registered nurse anesthetist) intraoperative report. The authors suggested incorporating the standardization of anesthesia handoff at an early stage in nurse anesthetists' career to provide the foundation for successful communication and meet accreditation and practice standards. Another supplemental resource offering context and breadth to the literature review was published by Lazarra et al. (2020) and examined the challenges and barriers encountered when conducting anesthesia handoff research.

The review of current literature provided significant evidence that intraoperative anesthesia handoff is associated with increased patient risk. Current literature supports the standardization of intraoperative anesthesia handoff in the form of handoff tools as they have improved employee perceptions of safety and quality of information transfer (Canale, 2018). As such, the synthesized evidence provided the foundation for the conductance of this QI project exploring CRNA perceptions of implementing a standardized intraoperative handoff at the partnering facility.

Project Framework

The theory of planned behavior, also known as the theory of reasoned action, was used to direct this DNP quality improvement project. The theory of planned behavior explains that behavioral intention is the most accurate indicator of behavior change (Hohmann & Garza, 2022). Current literature suggests that behavioral intention, or a person's intent to perform in a particular manner, contributes to approximately 15%-39% of the variance in actual change in behavior. The model was published by Icek Ajzen and Martin Fishbein in 1967 as a means to describe the correlation between human belief, attitude, intention, and behavior (Rollon, 2020). Their theory explains that people consider outcomes and implications of their behavior before they commit to engage or not engage in said behavior. Given the significant contribution of a person's intent towards behavior change, there are three components that determine a person's intent: attitude, subjective norms, and perceived control of the behavior.

The purpose of this DNP project is to examine CRNA perceptions and beliefs regarding use of the PATIENT mnemonic. Existing attitudes towards standardization of handoff, cultural and social norms and expectations in the anesthesia department, and the perception of control will influence incorporation of the handoff tool. Prior exposure in the form of positive or

negative experiences will also influence a CRNA's willingness to adopt the tool into current practice. As such, the theory of planned behavior framework can be used to explore intentions regarding standardized intraoperative anesthesia handoff checklists.

This project also relied on the plan-do-study-act (PDSA) method to guide execution of the project. Commonly used in quality improvement, PDSA is a cyclical, four step approach to improvement projects (Christoff, 2018). The first step is the *planning* phase. This phase includes expectations and outcomes for improvement as well as the "who, what, when, and where." Planning for this project included a review and synthesis of current evidence regarding intraoperative anesthesia handoff and its impact on patient outcomes, as well as the outcome of using standardized handoff tools.

The next step is the *do* phase. This phase involves the intervention outlined in the planning phase. This phase took place over two weeks at the participating facility. A pre-implementation survey was sent via email, and the participating CRNAs reviewed an educational PowerPoint presentation explaining the impact of intraoperative anesthesia handoff and the positive outcomes of the PATIENT mnemonic. CRNAs used the handoff tool in the form of a "badge buddy" attached to their facility name badge and used the tool for report involving two anesthesia providers for lunch break and change of shift. A post-implementation survey was provided after conclusion of the two-week period.

In the *study* phase, the data collected in the *do* phase is examined. Information in the pre- and post-implementation surveys was reviewed and analyzed. In the *act* phase, the plan is modified, incorporated into practice, or rejected. This project is QI in nature and not intended to change care but rather educate and inform the participants and provide foundation for further projects. The PDSA method is cyclical as there is fluid movement between phase four and phase

one as the process is continuously evolving, and more data is collected to inform the project and perhaps practice change. For this pilot DNP study, a single cycle of the PDSA method was completed, and the results were distributed in order to support further QI studies on this topic.

Ethical Considerations and Protection of Human Subjects

This project was submitted to the College of Nursing at East Carolina University (ECU) to evaluate the need for full Institutional Review Board (IRB) approval (Appendix D). Facility approval was sought through the partnering organization in collaboration with the ECU and Medical Center Institutional Research Board (UMCIRB). Local facility approval to collect project data was obtained from a representative of the anesthesia department at the partnering organization who provided their signature via the partnering organization's approval form. Prior to the initiation of this DNP project, the primary project lead completed the Collaborative Institute Training (CITI) Modules on October 27th, 2023 (Appendix E), to prepare for the formal approval process (<https://about.citiprogram.org/>).

As this project did not utilize patient data and did not involve patients at the partnering organization in any manner, this project was exempt from full review through the College of Nursing and UMCIRB. Participation in the project was on a voluntary basis and involved informed and willing participants from the nurse anesthesia department at the partnering facility. No more than minimal risk was introduced at the participants' expense, as all portions of the project fell within the standard operations of the anesthesia department. Prospective risks included increased length of report at the expense of receiving and sending CRNAs as they became familiar with the standardized method of anesthesia handoff and potential for increased stress related to time constraints.

Section III. Project Design

Project Setting

This quality improvement project was conducted in the operating rooms of an outpatient surgery center located in the southeastern region of the United States. According to the hospital's department of surgery, approximately 12,000 procedures requiring anesthesia are performed each year in 10 operating rooms. Many surgeries experience at least one anesthesia handoff, and longer cases may have multiple handoffs. This provides an ideal setting for implementation of quality improvement with a standardized anesthesia handoff tool.

Typically, intraoperative handoff between CRNAs is not standardized at this institution. After handoff is completed, a provider note in the EHR is placed by either the sending or receiving CRNA, but no facility-specific process is required in terms of content. This facility has many successful anesthesia patient outcomes without the use of a standardized handoff tool, and CRNAs with many years of experience may not feel that standardization will significantly improve patient care.

Project Population

The population participating in this quality improvement project included CRNAs working as permanent employees at the participating facility. CRNAs are registered nurses with a background in ICU nursing who have received advanced training in the administration of anesthesia in the form of a master's degree (MSN) or doctoral degree (DNP). The participating facility uses the anesthesia care model in which these advanced practice nurses provide anesthesia in collaboration with an anesthesiologist who medically directs several rooms.

This quality improvement project examined the use of the PATIENT mnemonic, an intraoperative anesthesia handoff tool created by a CRNA and nursing researcher, Suzanne

Wright. The handoff tool was used between anesthesia providers during handoff for lunch breaks and change of shift report. Prior to the data collection period, most CRNAs showed general interest and positivity towards the use of a standardized report. The largest general barriers to use of the intraoperative handoff tool identified prior to implementation were that there are no policies for using a standardized handoff tool for CRNA-to-CRNA handoffs, they increase the time spent giving handoff, and potential lack of reception, interest, or noncompliance by the receiving anesthesia provider. Additional barriers may include feeling rushed by the surgeon or relieving anesthesia provider, missing information from the handoff tool, or too much information in the handoff tool.

Project Team

The project team consisted of an SRNA project lead, three additional SRNA team members, and several university faculty members. The project was developed in collaboration with three SRNA group members but implemented independently. The project chair, who is currently a CRNA, university faculty member, and former nurse anesthesia program director, offered valuable insight into the facilitation of quality improvement projects, standard operating practices at the participating facility, and methods of scholarly writing. The current program director, a CRNA and university faculty member, served as the clinical contact and was instrumental in recruiting CRNAs at the participating facility for the project. Other team members included the course instructors, who provided detailed guidance and feedback for every step of the project, and the site contact, who signed the letter of approval stating that the team had permission to conduct the quality improvement project at the participating facility.

Methods and Measurement

The purpose of this quality improvement project was to assess CRNA perceptions of adequacy of the PATIENT mnemonic, a standardized intraoperative anesthesia handoff tool. The goal was to gain a better understanding of CRNA perceptions of this method in order to assess its usefulness as a handoff checklist in the transfer of care. This project used the PDSA cycle to review current literature; distribute an educational PowerPoint via email describing the support of current literature for the project and instructions for the intervention (Appendix F); provide the intervention tool (Appendix G); and collect data through pre-implementation and post-implementation surveys (Appendix H) completed by participating CRNAs.

In the *planning* phase, the primary project lead reviewed current literature regarding the positive and negative impact of intraoperative anesthesia handoff on patient outcomes, as well as the impact of standardized anesthesia handoff tools on patient care, perceptions of safety, and employee satisfaction. From the literature review, the project lead created the literature matrix (Appendix C) to synthesize and elaborate on findings in current literature, which served as a reference guide. Four meetings were conducted with the project chair and collaborating SRNA students to refine the project statement and purpose. Additional goals for the student and project chair meetings were to create an intervention tool for CRNA use and collaborate to produce an educational PowerPoint presentation.

In the *do* phase of the PDSA cycle, participants were selected by the clinical contact and emailed a pre-implementation survey via Qualtrics. This survey used yes/no, numerical, Likert-type scale, and free response questions to assess demographic information, current anesthesia handoff practices, factors that influence handoff, and perceptions of standardized anesthesia handoff tools. The theory of planned behavior was used to develop the survey questions. As

intention has been identified as the most significant predictor of behavior change, it was important to include survey questions that assessed CRNAs' current attitudes, beliefs, and perceptions of intraoperative handoff tools. The four SRNAs emailed participants a voice-over PowerPoint presentation describing literature support for standardized intraoperative anesthesia handoffs and how to use the PATIENT mnemonic.

The PATIENT mnemonic was distributed to participating CRNAs in the form of a "badge buddy," a small, laminated copy of the PATIENT mnemonic that provided details for each letter of the mnemonic. The tool was created to attach to the participating CRNAs' name badge for easy access and was laminated so that it could be wiped clean. Following implementation, the participants were provided with a post-implementation survey using yes/no, free response, and Likert-type questions to explore their perceptions and support for future use of the PATIENT mnemonic. The data within the surveys was kept anonymous for the purposes of the quality improvement project.

In the *study* phase, the descriptive data collected in the pre-implementation and post-implementation surveys was analyzed via Excel. Visual representations of the trends in data pre- and post-implementation were generated. In the *act* phase, the final step of the four-step PDSA cycle, the results of the project were presented to university faculty and fellow DNP nurse anesthesia students during a public presentation which was open to attendance by the partnering facility's staff. A financial and non-financial analysis was shared along with practice recommendations and implications for future PDSA cycles.

This project took place over the course of four academic semesters, beginning in the fall of 2023. The implementation of the project took place over a two-week period in 2024, from

April 22nd – May 2nd at the participating facility. Analysis of the data and presentation of the findings occurred in the summer and fall academic semesters of 2024.

Section IV. Results and Findings

Results

The purpose of this DNP QI project was to assess anesthesia providers' perceptions of adequacy of the PATIENT mnemonic to facilitate standardized handoffs of anesthetized patients. The primary goal was to better understand CRNA perceptions of this method in order to assess its usefulness as a handoff checklist in the transfer of care. Pre-implementation surveys were emailed to the seven participating CRNAs on April 21, 2024. There was approximately an 86% response rate, with six responses received between April 21-26, 2024. Responses to the pre-implementation questions confirmed that anesthesia providers did not currently use a standardized handoff checklist at the participating facility and the CRNAs were not previously familiar with the PATIENT mnemonic.

Use of the PATIENT mnemonic handoff checklist and data collection began April 22, 2024, and continued until May 2, 2024. Data collection was extended into a third week (18 days total instead of the planned 14 days) to accommodate for participating CRNAs' varying schedules (vacation time and offsite assignments). At the end of the data collection period, post-implementation surveys were emailed to each of the seven participating CRNAs. There was approximately a 71% response rate for this survey with five responses received between May 2-8, 2024. Survey data was collected via Qualtrics and analyzed with Excel software.

Data Presentation

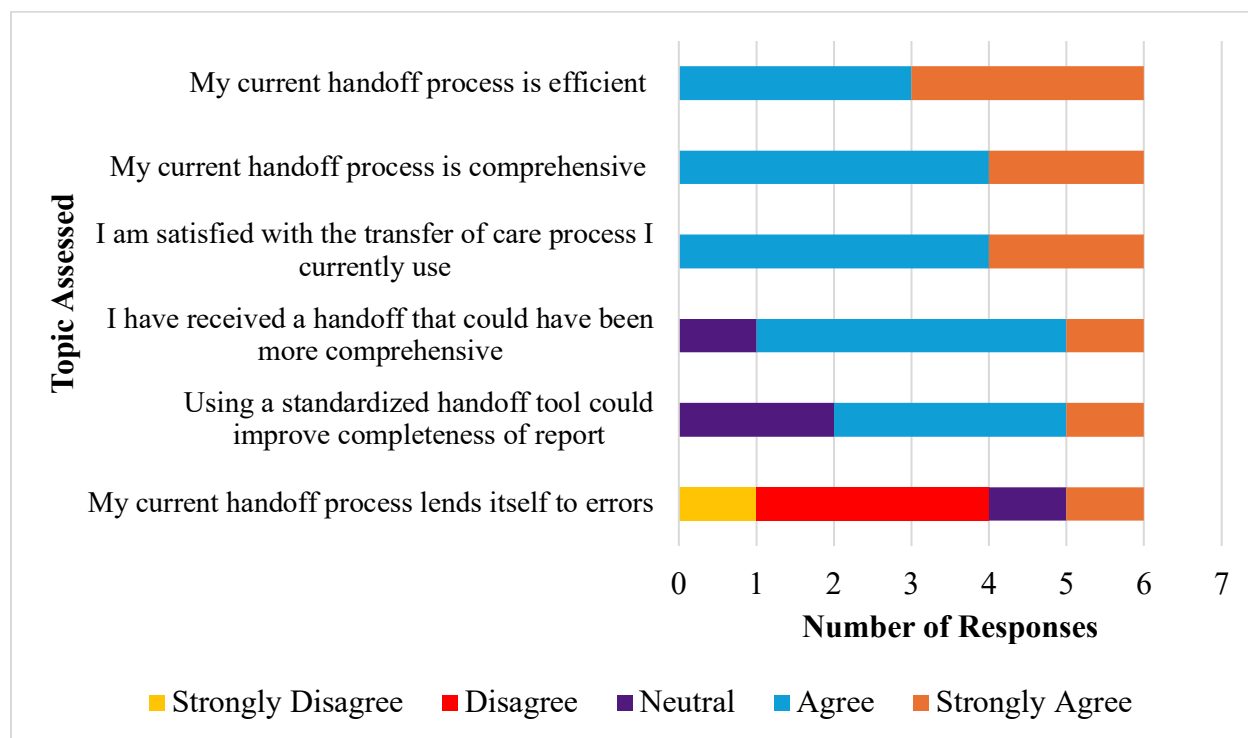
The pre-implementation survey assessed years of practicing anesthesia, satisfaction with current anesthesia handoff report methods, familiarity with the PATIENT mnemonic, and perception of standardized anesthesia handoff. Five of the six CRNA participants had been practicing for more than 16 years and one respondent had been practicing for 11-15 years. Four

of the six reported using a systematic way of providing report to receiving anesthesia providers for lunch break or change of shift, while two of the six reported that they did not use a systematic method for report. Two of the six CRNAs reported department use of a common standardized handoff tool, checklist, or mnemonic for providing report to receiving anesthesia providers, and four reported that it was not current practice to use common standardized handoff tools. None of the six participants were familiar with Suzanne Wright's PATIENT mnemonic as an intraoperative anesthesia handoff tool prior to this quality improvement project.

The CRNA participants were asked a series of Likert-style questions regarding their perceptions of current anesthesia handoff methods as well as the perceived impact of standardized anesthesia handoff on report. Their responses are depicted in Figure 1. Participants were asked to select "strongly disagree," "disagree," "neutral," "agree," or "strongly agree."

Figure 1

CRNA Pre-Implementation Likert-type Responses (n=6)

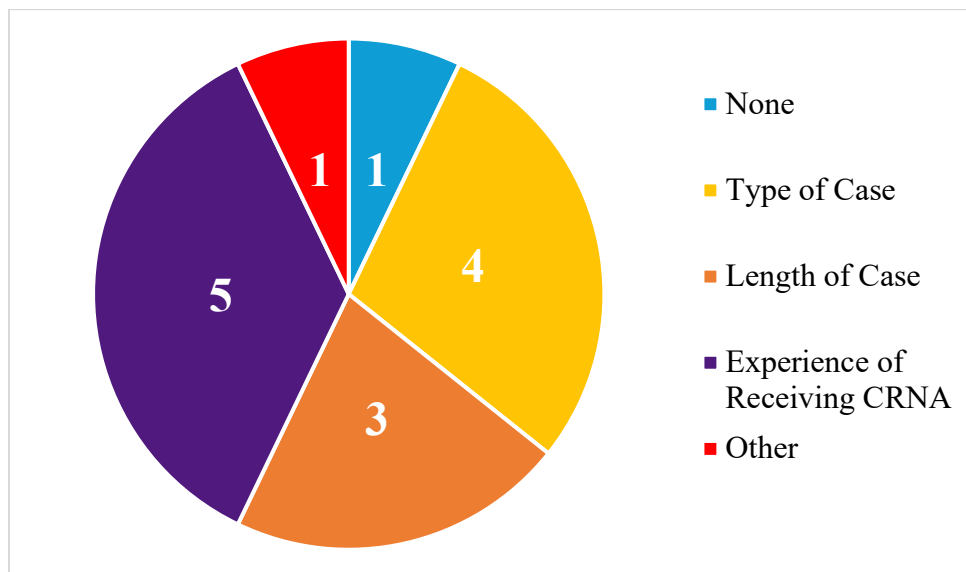


All six of the CRNAs reported their current handoff process was an efficient way of transferring information with three participants selecting “agree,” and the remaining three participants selecting “strongly agree.” The CRNAs indicated that their current methods of anesthesia handoff were comprehensive, with four participants selecting “agree,” and two participants selecting “strongly agree.” Four CRNAs “agreed” that they were satisfied with the transfer of care process they currently used, and two participants “strongly agreed.” All six of the CRNAs reported they had previously received an anesthesia handoff report that could have been more comprehensive, with one participant selecting “neutral,” four participants selecting “agree,” and one participant selecting “strongly agree.” Three participants “agreed” that using a standardized anesthesia handoff tool could improve the completeness of CRNA report, one participant “strongly agreed,” and one participant responded “neutral.” Participants did not report that their current handoff process lent itself to communication errors as one participant selected “strongly disagree,” three participants selected “disagree,” one participant selected “neutral,” and one participant selected “strongly agree.”

The last question in the pre-implementation survey asked participants to select all that applied regarding factors that influenced their current handoff practices. One participant selected “none,” four participants selected “type of case,” three participants selected “length of case,” five participants selected “experience of receiving CRNA,” and one CRNA selected “other,” and elaborated in the textbox, “lability of patient VS [vital signs].” These responses are depicted in Figure 2.

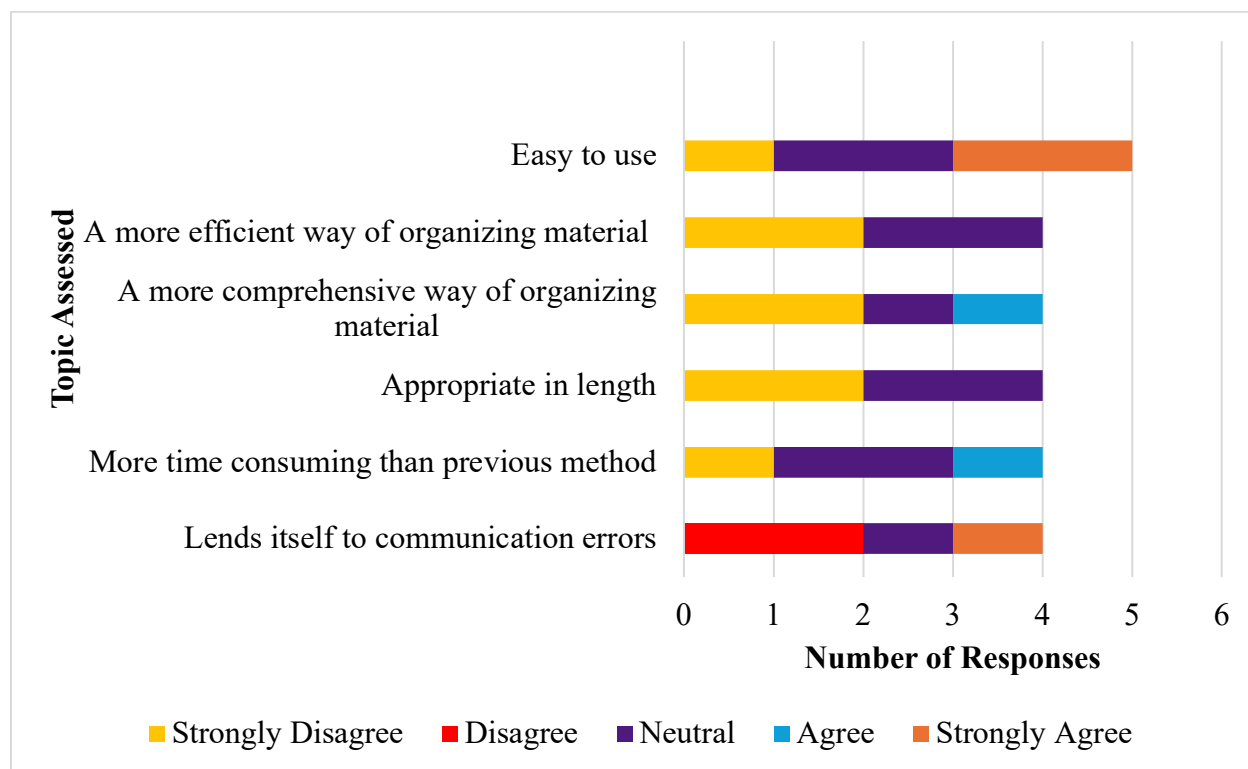
Figure 2

Factors influencing current CRNA handoff practices (n=6)



The post-implementation survey assessed PATIENT mnemonic use, perceptions of its adequacy as a handoff tool, and overall satisfaction regarding the mnemonic. Five CRNAs completed the post-implementation survey, although it should be noted that not every question was answered by all five CRNAs. Only four out of the five participants reported their overall usage of the PATIENT mnemonic tool, and only two out of those four used the tool for handoff. Over the two-week period of implementation, two CRNAs reported using the mnemonic zero times, one CRNA reported using the mnemonic between one and three times, and one CRNA reported using the mnemonic five times.

The CRNAs were asked a series of Likert-style questions regarding their perception of the PATIENT mnemonic handoff tool with the prompt, “I found the PATIENT mnemonic handoff tool.” Similar to the pre-implementation survey, participants were asked to select, “strongly disagree,” “disagree,” “neutral,” “agree,” or “strongly agree.” Figure 3 depicts their responses.

Figure 3*CRNA Post-Implementation Likert-type Responses (n=5)**I found the PATIENT mnemonic handoff tool:*

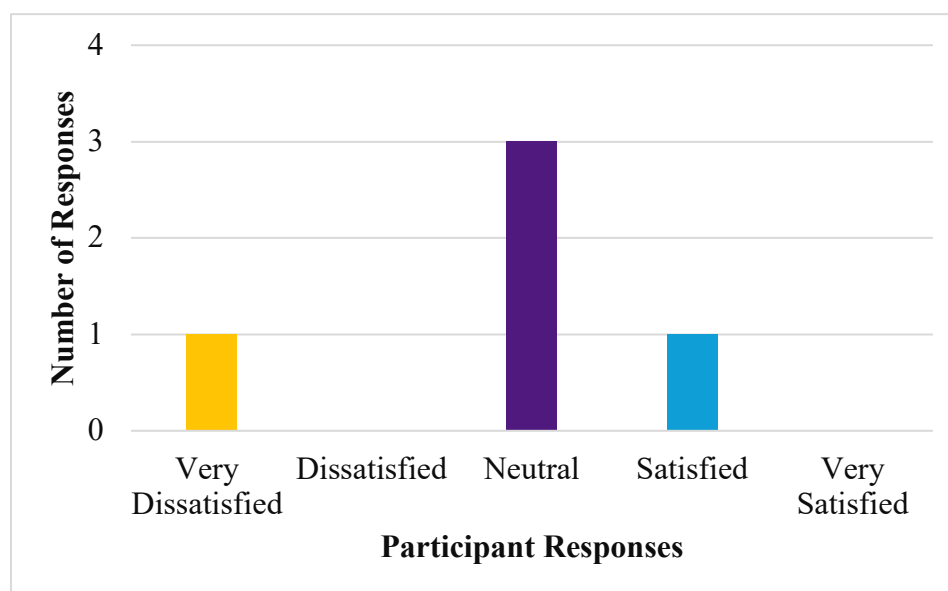
Two CRNAs “strongly agreed” that the PATIENT mnemonic was easy to use, two selected “neutral,” and one CRNA “strongly disagreed.” Two CRNAs selected “neutral,” and two selected “strongly disagree” regarding the efficiency of the PATIENT mnemonic handoff tool in organizing the material to communicate. Four of the five CRNA post-implementation survey participants answered the rest of the Likert-style questions. The CRNAs did not report that the PATIENT mnemonic handoff tool was a more comprehensive way of organizing the material to communicate, with two participants selecting “strongly disagree,” one participant selecting “neutral,” and one participant selecting “agree.” Two CRNAs selected “neutral” regarding the PATIENT mnemonic being appropriate in length, and two selected “strongly disagree.” One CRNA agreed that the PATIENT mnemonic was more time consuming than their

previous handoff method, one CRNA reported “neutral,” and two reported “strongly disagree.” One CRNA “strongly agreed” that the PATIENT mnemonic handoff tool lends itself to communication errors, one participant selected “neutral,” and two participants “disagreed.” Participants overall displayed neutrality towards the PATIENT mnemonic, with one CRNA selecting “very dissatisfied,” three selecting “neutral,” and one selecting “satisfied,” as illustrated in Figure 4.

Figure 4

CRNA Post-Implementation Responses (n=5)

I was _____ using the PATIENT mnemonic handoff tool



The CRNAs were asked to comment on why they would or would not like to adopt the PATIENT mnemonic handoff tool into their personal anesthesia practice. Only two of the five CRNAs who completed the post-implementation survey responded to this question. The first respondent reported, “it does not include needed information and does include irrelevant information.” The second respondent reported, “it is very comprehensive, just not applicable in every situation.” The survey also asked participants to describe anything they would change

about the PATIENT mnemonic handoff tool. Two of the five CRNA participants responded to this question. The first participant wrote, “[needs to] include: care providers (ologist!) [anesthesiologist] and phone/pager numbers for example. Leave out ‘temperature,’ unless seriously off baseline. Include [intraoperative] events relevant to [patient] care.” The second participant wrote, “A condensed version for 15 [minute] breaks, obviously I don’t have the numbers on this as far as percentages of breaks vs 30 [minute] lunches vs. total handoff of case. However, all the [information] may not be necessary for 15 [minute] break vs. a total case handover.” The final post-implementation survey question asked survey participants if they thought it would be helpful if the department created a department specific handoff mnemonic tool. Four of the five CRNAs selected “no,” and one of the five respondents selected “yes.”

Analysis

The CRNAs participating in this project were well established in their anesthesia careers, and five of the six participants had greater than 16 years of practice as a nurse anesthetist. Four of the six CRNAs already had a systematic method for providing anesthesia handoff report. When asked if all anesthesia providers in the department used a common standardized handoff tool/checklist/mnemonic to provide report to receiving anesthesia providers, four CRNAs reported “no,” and two CRNAs reported “yes.” None of the six CRNAs reported they were familiar with Wright’s PATIENT mnemonic as an intraoperative anesthesia handoff tool prior to the quality improvement project.

The pre-implementation Likert-style questions revealed the CRNAs were generally satisfied with their current anesthesia handoff methods and reported that they were efficient, comprehensive, and did not lend to communication errors. However, one CRNA “strongly agreed” that their personal handoff process lent itself to communication errors. The type of case,

length of case, and experience of the receiving CRNA influenced the participants' current handoff practices. One of the CRNAs selected "other" and elaborated in the comments, "the lability of patient vital signs."

Five of the six CRNAs reported that the experience of the receiving CRNA influenced their current anesthesia handoff practice. The six CRNA participants were permanent employees at the participating facility. They have a wealth of knowledge and experience providing anesthesia and work together daily. They have established rapport with one another, and therefore, anesthesia handoff report may often be concise and limited to the crucial components of anesthesia care. There is a great deal of trust in the receiving CRNA to appropriately assess the situation and intervene as necessary. When providing anesthesia handoff report to less experienced CRNAs that are not permanent employees of the participating facility, it is possible the CRNAs provide a more lengthy and detailed rapport.

Four of the five post-implementation survey participants reported their usage of the PATIENT mnemonic handoff tool. Two participants reported using the tool "zero times," one participant reported using the tool "between 1 and 3 times," and one participant reported using the tool "5 times." Two of the post implementation survey participants did not use the tool, which complicates interpretations of their thoughts about the tool's usefulness. Their perceptions of the tool's usefulness may have impacted their willingness to use the tool and may have acted as a barrier to implementation. It is not possible to draw any conclusions regarding changes to their perceptions about the tool during implementation. However, their opinions about the tool can be useful for understanding possible barriers to the implementation of a similar tool in future quality improvement projects. This data could help to guide future projects in designing a tool that may better address their concerns.

The CRNAs were asked a series of Likert-style questions, similar to the pre-implementation survey, regarding their experience with and perception of the PATIENT mnemonic tool. Five CRNAs responded to the first Likert-style question, and only four participants answered the rest of the Likert-style questions. The CRNAs generally reported that the tool was easy to use but did not report that the tool was more efficient, comprehensive, or appropriate in length when compared to their previous method of handoff report. There was a net neutral response regarding whether the tool was more time consuming, lent itself to errors, and overall satisfaction using the PATIENT mnemonic.

Two of the five post-implementation survey respondents commented on why they would or would not like to adopt the PATIENT mnemonic handoff tool into their personal anesthesia practice. One participant wrote, “it does not include needed information and does include irrelevant information.” The second respondent wrote, “it is very comprehensive, just not applicable in every situation.” When asked to describe anything they would change about the PATIENT mnemonic handoff tool, two of the five post-implementation survey participants responded. One participant wrote, “[needs to] include: care providers (ologist!) [anesthesiologist] and phone/pager numbers for example. Leave out ‘temperature,’ unless seriously off baseline. Include [intraoperative] events relevant to [patient] care.” CRNAs also reported their concerns with using the PATIENT mnemonic within the given time constraints at the participating facility. One CRNA participant shared, “a condensed version for 15 [minute] breaks, obviously I don’t have the numbers on this as far as percentages of breaks vs 30 [minute] lunches vs. total handoff of case. However, all the [information] may not be necessary for 15 [minute] break vs. a total case handover.” Eighty percent or four out of the five CRNAs did not think it would be helpful if the department created a department specific handoff mnemonic tool.

Section V. Implications

Financial and Nonfinancial Analysis

Expenses incurred in implementing the project were minor. The project lead and three additional SRNA group members printed and laminated copies of the PATIENT mnemonic anesthesia handoff tool. The approximate total cost for implementation was \$20 (U.S.) for thirty laminated copies of the mnemonic. Qualtrics survey software for confidential data collection was obtained via a license with East Carolina University, for which the cost was included in the group members' graduate student tuition. The IRB approval by the participating facility did not charge the student or university faculty any fees for the approval process.

The purpose of this quality improvement project was to assess CRNA perceptions of the adequacy of the PATIENT mnemonic as a standardized anesthesia handoff tool. As such, there was no monetary benefit, either direct or indirectly, resulting from implementation of the project. The participating facility was not charged with any expenses for the quality improvement project. However, the facility did benefit from observing the results of the project, which may inform future quality improvement projects or policy efforts aimed at improving intraoperative communication between providers through standardization of the handoff process at this facility.

Future quality improvement projects surrounding standardized anesthesia handoff communication could be incredibly cost-effective for the organization. Communication errors are attributed to 70% of sentinel events, with half of the breakdowns in communication occurring during patient handoff report, according to The Joint Commission (Canale, 2018). Consequences of incomplete communication during anesthesia handoff report may be as severe as an increased risk of inpatient mortality, major morbidity, postoperative complications, admission to an ICU, increased length of hospital stay, extended postoperative mechanical ventilation, wound

dehiscence, bleeding, pneumonia, emergent return to the OR, new onset hemodialysis, and postoperative delirium (Boet et al., 2020). According to Kilic et al. (2019), the estimated daily cost of an intensive care unit stay may be as much as \$3,678 per day. When compared to the potential for significantly increased patient costs, the financial benefits of implementing future quality improvement projects for a standardized anesthesia handoff tool are notable.

Potential costs for implementing further quality improvement studies include the cost of production for an anesthesia handoff tool. This cost may include paid employee time to collaborate and create a department and facility specific handoff tool. While CRNAs' overall perception of the PATIENT mnemonic as a standardized handoff checklist appeared negative, the anesthesia department may benefit from generating their own standardized handoff tool, created and tailored by those who will use it daily. Additional costs may include employee training time as well as time for adaptation to new workflow while incorporating the standardized handoff tool. When compared to the cost for the most severe complications of inadequate anesthesia handoff, the financial benefits of future quality improvement studies regarding intraoperative anesthesia handoff communication are significant, with potential to greatly reduce incurred patient costs from communication errors. Additional benefits may include improved employee perceptions of patient safety, satisfaction, efficiency, organization of patient information, and continuity in patient care.

Implications of Project

The participating CRNAs reported that the PATIENT mnemonic was easy to use but not more efficient, comprehensive, or appropriate in length compared to their personally used handoff methods. Overall satisfaction with the PATIENT mnemonic varied with the majority of CRNAs reporting "neutral" towards its use. This contradicts Canale's (2018) findings using the

modified PATIENT mnemonic in which results demonstrated statistically significant improvements in the quality and continuity of the transfer of information, CRNA perceptions of patient safety, and healthcare worker satisfaction. A significant difference between the two projects is that Canale created a change team consisting of 20 CRNAs that modified and adapted the PATIENT mnemonic to meet their specific and departmental needs prior to the two-week implementation period. Had the anesthesia department at the participating facility modified the PATIENT mnemonic to meet their own department and facility needs, CRNA satisfaction with the handoff tool may have been significantly improved.

Standardized anesthesia handoff communication is supported by the AANA as it has been repeatedly demonstrated to cost-effectively improve CRNA perceptions of patient safety, efficiency of information transfer, and continuity of care as published by Wright (2013), Gibney et al. (2017), Canale (2018), Lambert and Adams (2018) and Gabot et al. (2022). The AANA has published 14 nurse anesthesia practice standards, in which standard 11 outlines safe transfer of care. Additionally, The Joint Commission has published multiple findings tying breakdowns in communication to increased potential for patient harm. Standardized anesthesia handoff communication also meets the Institute for Healthcare Improvement's (IHI) Triple Aim framework goal to improve the patient experience of care, improve population health, and reduce per capita cost of healthcare.

Standardized anesthesia handoff communication has significant implications for patients and nursing practice as a whole. Future quality improvement studies may be informed through this project, leading to further nursing research involving patient outcomes to include adverse events, morbidity, and mortality, which were not examined in this project. When communication is improved during the transition of care, the risk for error is reduced, and therefore, the risk for

adverse events is also reduced. Abraham et al.'s (2021) systematic review and meta-analysis examined the impact of anesthesia handoff tools on provider satisfaction, information transfer, length of handoff, and adherence. All six included studies provided evidence to support the use of anesthesia intraoperative handoff tools as they improved outcomes related to effective communication (increased retention of patient data and mutual communication), efficiency (length of handoff), incorporation into practice, and provider satisfaction. When anesthesia handoff communication is standardized, CRNAs no longer have to rely on trust in the receiving anesthesia provider's ability to perceive patient circumstances and review the EHR to determine patient specific information. When information transfer is consistently complete, comprehensive, and concise, CRNA perception of patient safety increases, and therefore, employee satisfaction and employee retention may be improved.

Sustainability

The financial costs incurred by this quality improvement project were minimal, and therefore, the sustainability of a larger quality improvement project conducted by the participating facility is quite conceivable. This quality improvement project examined CRNA perceptions of the PATIENT mnemonic using a relatively small number of CRNAs. A similar quality improvement project could be maintained with a larger number of CRNAs with additional cycles of the plan-do-study-act method to tailor future anesthesia handoff communication tools to CRNA needs.

Barriers to sustainability may include coordination of schedules in order to provide time for anesthesia departmental collaboration in producing a modified facility specific mnemonic tool for anesthesia handoff use. Collaboration by the department may or may not be considered paid working hours, and this potential cost of time and money to the organization would have to

be considered. Additional barriers to sustainability include CRNA perception and attitude towards standardized anesthesia handoff tools. While the pre-implementation survey results showed a largely positive or neutral attitude towards the PATIENT mnemonic, the extensive anesthesia experience, contentedness with previously tried and true methods, and significant time constraints for report at this facility may render the CRNA employees less receptive to implementing a standardized anesthesia handoff tool. However, these concepts were not directly measured in this project.

Additional quality improvement projects to support the implementation of standardized anesthesia handoff tools may include an examination of staffing needs. Projects examining the most frequently communicated components in anesthesia handoff report may also provide additional information to facilitate the creation of a department specific anesthesia handoff tool. A comparison may also be made by observing anesthesia handoff report given between permanent facility staff and employees providing temporary staffing coverage from the neighboring facility to the participating facility. This could help determine the most frequently communicated components in anesthesia handoff report between differing staff as well as the components most frequently excluded. A standardized anesthesia handoff tool may benefit employees providing temporary staffing coverage as they are providing anesthesia in an environment that they may not be as familiar with. Standardized communication may serve to increase perception of patient safety as well as confidence in the completeness of information communicated.

Dissemination

The findings of this project were disseminated via a poster presented by the project lead to an audience consisting of nurse anesthesia department members, university faculty members,

fellow SRNA students, and the project chair. The project participants were invited but not required to attend the project presentation. The finalized version of the DNP quality improvement project paper as well as the poster presentation were uploaded to The Scholarship, a university digital repository containing academic works created by university staff, faculty, and students.

Section VI. Conclusion

Limitations

There were several limitations associated with this DNP quality improvement project. One of the largest limitations was sample size, which was additionally impacted by the number of participating CRNAs and the time constraints of a two-week data collection period. Two of the seven emailed participants were on vacation during the first week of data collection and were not able to complete the pre-implementation survey or use the anesthesia handoff tool according to schedule. One CRNA participant did not receive any of the project communications via email, despite technical troubleshooting, and thus was unable to complete the pre-implementation survey or post-implementation survey, resulting in a maximum total of six project participants. The small sample size may have impacted the validity of the survey results, leading to potential introduction of bias.

An additional limitation is that only four of the five participants who completed the post-implementation survey reported their use of the tool, and only two of those participants used the tool. The tool was only used for a total of one to five times by the two participants who reported their usage. This, too, may have biased the results. Limited use of the handoff tool complicates the interpretation of data regarding the tool's usefulness as a future handoff method. Drawing conclusions about changes in perception before and after use of the tool is not possible as the tool was not frequently used, if used at all. Pre-implementation perceptions regarding the tool can be used to inform future quality improvement projects regarding potential barriers to implementation, which may serve as a guide in designing a tool that addresses the local CRNA concerns. The use of the PATIENT mnemonic for anesthesia handoff was also not directly observed during the implementation of this project, and thus survey results reflected the CRNAs'

subjective recall regarding its use, which also may potentially introduce bias into the project results.

Recommendations for Future Implementation and/or Additional Study

This quality improvement project was considered a pilot project, and the project lead had the opportunity to collaborate with SRNA group members to develop the surveys, an educational PowerPoint, and an intervention tool while implementing the project independently in order to gain knowledge and experience with each step in the PDSA cycle. A continuation of this quality improvement project at this facility with a facility specific handoff tool created through collaboration with the CRNA participants for a longer implementation period may yield more statistically significant data and allow for a more thorough analysis. Collaboration with CRNA participants would allow for the creation of a handoff tool that addresses specific concerns regarding which items are essential and which items can be excluded, which may potentially increase participation and CRNA satisfaction with the tool.

CRNAs provided additional feedback regarding the abbreviated version of the PATIENT mnemonic printed on the laminated copy of the badge buddy. While the educational PowerPoint presentation provided a full-size copy of the PATIENT mnemonic (Appendix F) with additional details and clarification for each component of the mnemonic, the physical copy of the badge-buddy did not. For example, CRNAs questioned why they needed to share the ETCO₂ number with the receiving CRNA and were directed to the complete version of the PATIENT mnemonic in the PowerPoint presentation in which the “E” in PATIENT symbolized ETCO₂ to include ventilation, respiratory rate, peak inspiratory pressure (PIP), and fraction of inspired oxygen (FiO₂). Future projects should consider printing the complete version of the PATIENT mnemonic with clarification for each component of the report on the back side of the laminated

badge buddy. Additional recommendations to be addressed in future quality improvement or research projects include the presence of a project champion. This would serve to provide clarification regarding the tool's use and handoff components to be included, as well as exclude the reliance of subjective recall for frequency of use, which would strengthen data collection.

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Appendices

Appendix A: Concept Table

	Concept 1 Intraoperative	Concept 2 Handoff	Concept 3 Anesthesia
Key Words	Intraoperative Note: Attempted to use keywords such as “operating room” and “perioperative” but found the best search results with “intraoperative” as primary term.	Handoff Transfer of Care Handover	Anesthesia Anesthetist
PubMed MeSH	Note: No MeSH terms found for “intraoperative” or “perioperative” key words. Not used: “operating rooms” [MeSH Terms]	Note: No MeSH terms for handoff, transfer of care, or handover.	“anesthesia” [MeSH Terms] “anesthetists” [MeSH Terms]
CINAHL Subject Headings	(MH “Intraoperative Monitoring”)	(MH “Hand Off (Patient Safety)”)	(MH “Certified Registered Nurse Anesthetists”) AND (MH “Anesthetists”)
Google Scholar	Searched keyword “intraoperative”	Searched keywords “handoff OR handover OR transfer of care”	Searched keywords “anesthesia” OR “anesthetist”

Appendix B: Literature Search Log

Search date	Database or search engine	Search strategy	Limits applied	Number of citations found/kept	Rationale for inclusion/exclusion of items
09/29/23	PubMed	(intraoperative) AND ((anesthesia) OR (anesthetists)) AND (handoff OR (transfer care)) ((((("intraop"[All Fields] OR "intraoperative"[All Fields] OR "intraoperatively"[All Fields]) AND ("anaesthesia"[All Fields] OR "anesthesia"[MeSH Terms] OR "anesthesia"[All Fields] OR "anaesthesias"[All Fields] OR "anesthesias"[All Fields])) OR ("anaesthetist s"[All Fields] OR "anesthetist s"[All Fields] OR "anesthetists"[MeSH Terms] OR "anesthetists"[All Fields] OR "anaesthetist"[All Fields] OR "anaesthetists"[All Fields] OR "anesthetist"[All Fields])) AND ("handoff"[All Fields] OR "handoffs"[All Fields] OR ("patient transfer"[MeSH Terms] OR ("patient"[All Fields] AND "transfer"[All Fields]) OR "patient transfer"[All Fields] OR ("transfer"[All Fields] AND "care"[All Fields]) OR "transfer care"[All Fields]))) AND	5 years (2018-2023) English Language	100/21	The selected articles contained pertinent information to the quality improvement project to include summaries, studies, and analyses of the impact of intraoperative anesthesia handover or a standardized handoff on patient outcomes, safety and perceptions of safety, healthcare worker satisfaction, and continuity of care. To meet the criteria, the articles must include handover or transfer of care between two anesthesia providers and include information regarding the safety of handover, the positive or negative impact of standardized checklists, and a discussion of outcomes pertaining to those measures. Excluded items examined communication between various licensed staff members in different hospital

		((english[Filter]) AND (2018:2023[pdat]))			settings or articles that contained no pertinent information to the topic.
09/29/23	CINAHL	((MH "Hand Off (Patient Safety)") OR "handoff") AND ((MH "Certified Registered Nurse Anesthetists") OR (MH "Anesthetists") OR "nurse anesthetist"))	5 years (2018-2023) English language Academic Journals	23/5	The same criteria used for PubMed.
09/29/23	Google Scholar	(intraoperative) AND (anesthesia) OR (anesthetists) AND (handoff OR (transfer care))	5 years (actual years 2018-2023)	17,000/10 (10 pages reviewed, 22 articles kept)	The same criteria used for PubMed.

Appendix C: Literature Matrix

Year	Author, Title, Journal	Purpose & Conceptual Framework or Model	Design and Level of Evidence	Setting	Sample	Tool/s and/or Intervention/s	Results
2023	Allen, R., Nemec, C., O'Guin, C., Wright, S., & Dalley, C. B. (2023). Temporary intraoperative handoff report among nurse anesthetists: Utilization of standardized handoff tools and barriers to implementation. <i>American Association of Nurse Anesthesiology Journal</i> , 91(2).	The purpose of this study was to examine the use of standardized handoff tools between CRNAs and determine the barriers to their use during intraoperative anesthesia handoff. This study examined temporary handoffs and not change of shift handoffs. No framework or conceptual model noted.	Qualitative descriptive design - Level VI	Hospital OR	n = 197 Inclusion criteria were CRNAs active in the workforce that were AANA members. Survey sent to 2,852 CRNAs, 197 complete responses recorded.	A SurveyMonkey data collection tool was emailed from the AANA Research Department to 2,852 CRNAs randomly selected by a computer-generated number. The survey was 16 questions examining demographics, frequency of temporary intraoperative breaks, usage of standardized handoff tools, barriers to using standardized tools, and aspects of implementation. The data were analyzed via SPSS version 26. Descriptive statistics were conducted on demographic data and	Study provides evidence for breakdown in communication leading to sentinel events as identified by TJC. • Explains the OR as distracting environment • Identifies most common omitted information • 81.2% of the studies participants reported that they do not use a standardized handoff tool but 57.1% of the participants agreed that these tools should be used for report. • CRNAs who used standardized handover tools were much less likely to rank “increases the time spent giving a handoff”

						Pearson Chi-square tests were conducted to determine associations between using handoff tools and years of clinical practice, anesthesia specialty, and hospital setting.	as a practice barrier (48.6%) • Top 3 barriers were: the facility did not make standardized handoffs the standard of care, standardized handoffs increased the time spent giving a handoff, and a lack of reception/interest/noncompliance by the anesthesia provider receiving the handoff.
2023	Schiavi, A., Mershon, B. H., Gottschalk, A., & Miller, C. R. (2023). Measurement of information transfer during simulated sequential complete shift-to-shift intraoperative handoffs. <i>Mayo Clinic Proceedings: Innovations, Quality, & Outcomes</i>, 7(1), 9-19. https://doi.org/10.1016/j.mayocpiqo.2022.11.001	This study analyzed anesthesia intraoperative handoffs in a simulation facility. Two cohorts were selected from anesthesia residents to participate in the study that evaluated handoffs with the use of an intraoperative handoff tool and without (control). Through these methods, this	Non-randomized Control Trial – Level III	Simulation Facility	Cohort 1 (2017), n = 52 residents Cohort 2 (2019), n = 50 residents • Participants were PGY2, PGY3, and PGY4 anesthesia residents at the participating teaching hospital.	• Intervention consisted of a handoff tool incorporated into the Epic healthcare computer system. The mnemonic HANDOFF was used: H: How sick is the patient? A: Airways/access N: New/iNtraop D: Drugs/disposition O: Opioids/pain plan F: Fluids F: Fears/future plans/follow me (readback)	• Errors in communication and a loss of information contribute to 80% of medical errors • Estimated 4,000 handoffs take place per day in a standard teaching hospital • 7.2 million inpatient surgeries occur each year and 40% of those surgeries involve complete anesthesia handoff • 600,000 preventable adverse outcomes occur each year due to

		study discovered that patient information is repeatedly omitted through sequential anesthesia intraoperative handoffs. The HANDOFF intervention tool used in this study decreased omitted information but did not completely prevent omission. The HANDOFF tool prevented critical information from being omitted. No framework or conceptual model noted.				• Research team created an EMR simulated perioperative record • Study participants were randomized and asked to provide handoff using their memory or the handoff tool • Each handoff consisted of 25 informational elements assessed on a scale of 0-2 with the highest score of 50. • Handoffs took place in a chain with 16 participants being the “first” in the chain. Each person in the separate chain received report from the previous person. Chains of handoffs ranged from 2-4 people total. • Power analysis not performed, significance between groups was evaluated by means of logistical	incomplete anesthesia handoff. • Conclusion: Anesthesia intraoperative handoff consistently results in the omission of patient information which is partially prevented using a standardized handoff tool. The tool serves to prevent critical but not all omissions. • This study took place via a simulation – therefore no real data was used. Subjects were under the Hawthorne effect in which their behavior potentially was altered due to the awareness of being observed. • An email with case specific information was sent to participants one day prior to the study taking place – This does not simulate a typical anesthesia environment in which the anesthesia provider
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						regression. The study used the Akaike information criterion for model selection. The analysis of the data was performed via Stata 16.0	reviews the chart for often as little as less than an hour before the case. • Handoff rarely occurs twice or more in an anesthesia case. A handoff of 2-4 individuals may exaggerate the loss of patient information and thus may not simulate a real-life scenario. • The study did not examine handoff differences between anesthesia providers (CRNAs, Anesthesia Associates, Anesthesiologists, etc.) • Most RCT's aim to improve provider satisfaction but it is difficult to follow patient morbidity and mortality outcomes with anesthesia handoff. • This method of study (simulation) may be used to evaluate and compare/contrast the use of anesthesia
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							handoff tools to determine information transfer and retention. • Other limitations of the study include a lack of the distracting environment that the OR poses, participant awareness of evaluation, sequential handoffs are not reflective of actual clinical practices, and the amount of time given to retain the information in this scenario does not reflect actual circumstances. The control group provided handoff solely from memory which does not reflect current practice and potentially exaggerated negative results with this method.
2022	Meersch, M., Weiss, R., Küllmar, M., Bergmann, L., Thompson, A., Griep, L., Kusmierz, D., Buchholz, A., Wolf, A., Nowak, H., Rahmel, T.,	This randomized control trial examined the effect of intraoperative anesthesia	RCT – Level II	Hospital OR	n = 1,772. Inclusion criteria were adult patients with an ASA 3-4 that were	Cochran-Mantel-Haenszel test was performed as a primary test. The Fisher categorical test, Cox regression	This study revealed that in adults undergoing major surgery there is not a statistically significant difference between outcomes of

	Adamzik, M., Haaker, J. G., Goettker, C., Gruendel, M., Hemping-Bovenkerk, A., Goebel, U., Braumann, J., Wisudanto, I., ... Zarbock, A. (2022). Effect of intraoperative handovers of anesthesia care on mortality, readmission, or postoperative complications among adults: The handiCAP randomized clinical trial. <i>JAMA Network</i>, 327(24), 2403-2412. https://doi.org/doi:10.1001/jama.2022.9451	handover on patient outcomes. Included variables were mortality, readmission, or advanced postoperative complications in a 30-day window. Complications included the patient requiring a ventilator postoperatively for 48 hours or more, requiring surgical revision of a wound, major bleeding requiring blood products, pneumonia, new atrial-fibrillation, moderate or severe acute kidney injury, new requirement for dialysis, cardiac arrest, a myocardial infarction, sepsis, stroke, pulmonary embolism, deep venous			scheduled to have major surgery.	test, and Grambsch-Therneau tests were performed on the data as well. The primary composite outcome did not reveal a significant difference in the group with 268 events (30.1%) in the handoff group and 284 (32.5%) in the no handoff group.	patients who had anesthesia handoff during their surgery and patients who did not. • This article refutes the claim that standardized communication tools would significantly improve patient outcomes as their collected evidence shows that unstandardized handoffs themselves did not greatly affect the patient's mortality, readmission, or postoperative complications in a 30-day window. Limitations: this study did not include night/weekend surgeries when clinicians are fatigued, and patients may require emergency surgery. In other words, with increased risk in an environment where handovers could harm the patient. This study
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		thromboembolism, shock, or unexpected need to reoperate within 30 days. No framework or model noted.					did not account for the quality of handover. Intraoperative complications were also not recorded.
2022	Lane, S., Gross, M., Arzola, C., Malavade, A., Szadkowi, L., Huszti, E., & Friedman, Z. (2022). What are we missing? The quality of intraoperative handover before and after introduction of a checklist. <i>Canadian Journal of Anesthesia</i> , 69, 832-840. https://doi.org/10.1007/s12630-022-02238-9	The purpose of this study was to examine the effects of a checklist on intraoperative anesthesia handover. No framework or conceptual model was used.	QI Project – Level VI	Hospital OR	n = 67. Nonrandom selection of subjects. Study participants included anesthesia consultants, fellows, and residents in elective ORs. 58 handoffs were recorded as baseline and 54 handoffs were recorded using the standardized anesthesia handoff tool.	A single-center prospective before-and-after study was completed at a large medical facility in Toronto. The study took place over seven months in 2016 at a tertiary academic center. Baseline anesthesia handoff was videotaped and analyzed and compared to anesthesia records. A standardized anesthesia handoff tool was provided to the participants and the quality of information transfer was compared before and after the introduction of a checklist.	The use of a checklist improved the completeness of handover by 6%. • No relationship between type of anesthesia provider and completeness of handoff. • Average completeness of handover was 72% in the baseline group and 79% in the standardized handoff group. • This study is unique as it used video recordings to analyze the evidence. • The study identified items that were frequently vs infrequently excluded

						• Completeness of each handoff was calculated as the number of optimal items communicated divided by the total number of optimal items for each case specifically. • The data was analyzed via a t-test and Fisher's exact tests. Statistical analysis was performed using R version 3.5.1	(depth of airway vs blood loss). • Over the six-month study period, anesthesia handoff reliability increased from 20 to greater than 95%. • Most of the handovers were interrupted and the study concluded that the interruption of anesthesia handoff does not greatly impact the quality of the transfer of care information. • Limitation: The Hawthorne effect – participants knew they were being videotaped and possibly modified their handoff to include more information than at baseline. • Using a handoff tool shifts the focus of the anesthesia provider to the tool itself which places a greater emphasis on the importance of handoff and thus more complete and accurate
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							information is communicated.
2022	Gabot, M., Hintz, C., & Sass, E. (2022). Implementation of a SAFE OB handover for CRNAs. <i>American Association of Nurse Anesthesiology Journal</i> , 90(1).	The purpose of this QI project was to improve CRNA communication and increase situational awareness for Sick, At-risk, Follow-ups, and Epidurals (SAFE) patients using the SAFE Handover Tool for CRNAs. Cost-effective and sustainable measure to improve the quality of transition of care and patient safety. No conceptual model/framework used.	QI Project – Level VI	Hospital OB unit	n = 15. Convenience sample of 15 CRNAs that met inclusion (CRNA practicing at facility) and exclusion (non-OB and infrequently practicing) criteria. CRNAs included practiced > 2x/month providing OB anesthesia.	Pre-intervention survey with Likert response questions provided via SurveyMonkey hyperlink followed by education as an online presentation, intervention, and post-intervention survey. Implementation of standardized handoff was conducted using the modified SAFE Handover Tool for Sick (hypertension, pre-eclampsia, sepsis, febrile, cardiopulmonary and other systemic disease), At-risk (hemorrhage, cesarean section, or anesthetically relevant problems), Follow-ups (hemorrhage, neurological deficit, post-dural puncture headache), and	Limitations: Small sample size and convenience sampling affect generalizability to the larger population. Small sample decreases the power of the study and increases the probability of Type II error. • Handover quality was assessed via subjective CRNA assessment. Cannot prove that enhanced handover quality causes improved patient outcomes. • Specific to OB population, however, highlights the importance of transfer of information as labor lasts multiple hours and multiple shifts, resulting in multiple handoffs. Each handoff is opportunity for potential error.

						Epidural (current/problematic epidurals) - (SAFE) patients. Statistical analysis was conducted with the use of SPSS 26.	• Because of dynamic changing environment of OB unit, the SAFE Handover Tool will need frequent updating – an application to the dynamic environment of OR anesthesia. Failure to update the tool will make its use prone to errors and inaccurate. • Putting the SAFE tool into EHR will provide real-time updates to care, enhance the efficiency of care, and improve staff compliance. • Emphasis on the tool providing increased situational awareness – perceiving the pieces of the patient’s condition and environment as part of the whole and making an assessment and intervening continuously to provide tailored care. • Barrier to implementation identified as the
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							perceived need to continuously update the SAFE tool to reflect current patient needs and facility practice. This is perceived as increased workload for the anesthesia provider.
2021	Kannampallil, T., Lew, D., Pfeifer, E. E., Sharma, A., & Abraham, J. (2021). Association between paediatric intraoperative anaesthesia handover and adverse postoperative outcomes. <i>British Medical Journal</i> , 30(9), 755-763. https://doi.org/10.1136/bmjqs-2020-012298	The purpose of this publication is to examine the effect of anesthesia intraoperative handover and to determine its effect, if any, on patient postoperative outcomes in pediatric surgery. No framework or conceptual model noted.	Observational Study – Level VI	Hospital OR	n = 5,411 pediatric surgeries with anesthesia handover, n = 78,321 pediatric surgeries total. Population included pediatric surgical patients who received anesthesia during surgery at a local tertiary children's hospital between the years of 2013 and 2018. Procedures	No intervention or handoff tool noted. Variances in demographic and clinical elements of the surgeries with and without intraoperative anesthesia handoff were compared via t-tests for continuous variables and X squared tests for categorical variables. Statistical analyses were performed via SAS version 9.4 and estimates were created via logistic regressions using PROC LOGISTIC and PROC SURVEYLOGISTIC.	• Anesthesia handovers happen in approximately 20% of all surgical cases • In adult surgical patients, multiple studies have been found to prove a positive correlation between anesthesia handover and increased morbidity and mortality. • This article examined the effect of intraoperative anesthesia handoff on postoperative complications 30 days after pediatric surgery. Six major comorbidities were examined postoperatively – cardiac, respiratory,

					lasting less than 30 minutes and those classified as ASA-PS VI (deceased organ donors) were excluded from the cohort. Handoffs studied only included those that occurred between two clinicians and the sending anesthesia provider did not resume care within a 30-minute window. Handover was examined between CRNAs, attending anesthesiologists, residents, and fellows.	gastrointestinal, urinary, bleeding, and infection. Morbidity was based on billing International Classification of Diseases (ICD) diagnosis codes. • The results of this study suggest that there is no association between intraoperative anesthesia handoff and negative postoperative outcomes in pediatric surgical patients. • The authors of this article believe that given the results of this study, intraoperative anesthesia handoff is a care neutral event, unlike other literature suggests. This event can also offer additional safety benefits as it allows two anesthesia care providers to review patient information in real time. • Suggests that anesthesia handoff
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							allows “fresh eyes” to review patient information and catch and rectify any errors in care. • Handoff reduces clinician fatigue which may decrease errors of that nature. • The article acknowledges the Joint Commission’s response to failure in communication leading to adverse outcomes by standardization of handoff but provides literature that suggests this intervention has mixed outcomes. • The authors acknowledge a significant confounding variable that is surgical duration – the longer the surgery, the greater the fatigue, the increased number of handoffs, the more likelihood of miscommunication, therefore leading to
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							increased morbidity and mortality.
2021	Abraham, J., Pfeifer, E., Doering, M., Avidan, M. S., & Kannampallil, T. (2021). Systematic review of intraoperative anesthesia handoffs and handoff tools. <i>Anesthesia & Analgesia</i>, 132(6), 1563-1575. https://doi.org/10.1213/ANE.0000000000005367.	A systematic review that synthesizes current literature regarding the impact of intraoperative handoffs on patient outcomes and the effect of intraoperative handoff tools on patient outcomes. Discussion includes information transfer, clinician satisfaction, adoption and use, handoff duration and documentation, sustainability of handoff tools and outcomes, and quality assessment. No conceptual framework or model used	Systematic review and meta-analysis – Level I	Hospital OR	n = 14. Fourteen studies met inclusion criteria. Eight studies were retrospective cohort studies. Six studies used a nonrandomized prospective design to evaluate effects of handoff tools on outcomes. Databases searched for studies meeting inclusion criteria of evaluation of impact of intraoperative handoffs on patient outcomes and evaluation of impact of	Quality of the studies was evaluated using the Newcastle-Ottawa Scale. Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) framework was used for review).	• Defines transition of care and anesthesia providers who participate. • Examined intraoperative handoffs between variety of anesthesia providers Handoffs are an opportunity for both error and error-reduction. • Seven of the eight retrospective studies reported a positive association between intraoperative handoffs and adverse clinical outcomes. All six prospective tool studies showed significant improvements to process outcomes related to effectiveness (information retention, bilateral communication, efficiency, adoption, handoff satisfaction) with anesthesia handoff tools.

					intraoperative handoff tools on outcomes. Studies included a total of 680,855 surgeries and 139,426 had at least 1 handoff.		• This analysis discovered that checklists that were created for CRNA providers systematically excluded information that was included on checklists made for anesthesiology providers. CRNA checklists excluded information related to lab values, patient demographics, hemodynamics, postop nausea and vomiting prophylaxis, PACU orders/future plans, and intraoperative anticipatory guidance. High level of evidence, very thorough and technical. Quantitative study is useful for generalization of the results. Large sample size.
2021	Mershon, B. H., Vannucci, A., Bryson, T., Lin, F., Greilich, P. E., Dear, G., Guffey, P., & Agarwala, A. (2021).	The purpose of this study was to create a standardized anesthesia	Descriptive/Qualitative Design – Level VI	N/A	N/A	The Multicenter Handoff Collaborative, Anesthesia Patient Safety Foundation,	• The article opens with quote from George Bernard Shaw – “The single biggest problem in communication is

	A collaborative partnership between the multicenter handoff collaborative and an electronic health record vendor. <i>Applied Clinical Informatics</i>, 12(3). https://doi.org/10.1055/s-0041-1731714	intraoperative handoff tool that is integrated into the electronic health record that is functional, intuitive, and improves patient care. No framework or conceptual model noted.				and Epic Systems formed a partnership to create and implement a standardized intraoperative handoff tool for anesthesia providers. The tool includes pertinent patient information such as medical history, surgery, airway, intravenous lines, fluid balance, blood products, allergies, intraoperative medications given, lab data, and intraoperative events.	the illusion that it has taken place.” • A lack of thorough communication intraoperatively between anesthesia providers has been identified as early as 1978 in which inadequate communication was the 3rd most common factor associated with errors in anesthesia care. • Factors that contribute to a lack of thorough communication intraoperatively: training and clinician experience differ, the point in the surgery can impact the information reported, patient emergencies may occur during handoff that interrupts the flow of communication and demands the attention of the providers, and the many distractions that the OR offers such as noise, conversation, music, etc.
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							• The intraoperative handoff period has been often compared to the postoperative handoff period – however they are distinctly different as postoperative report often takes place in a more controlled environment that offers less distractions. The patient is less likely to emergently require anesthesia attention and the flow of report is not interrupted. • Handoff that is embedded into the EHR has the potential to decrease waste and enhance the efficiency of communication. Standardized anesthesia handoff reduces the difficulty by introducing routine of care. The article cites other instances in which standardization has improved patient care – using insulin administration
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							protocols to prevent hypoglycemia and standardizing central venous catheter insertion to reduce central line infections. • The use of EHR as opposed to a paper cognitive aid is that it combines real-time patient specific information with a standardized handoff that allows for accurate and concise relay of information. • Limitations: the development of the tool lacked input from a variety of anesthesia providers such as AAs, CRNAs, residents, fellows, etc. The tool was formed from the input of anesthesiologists alone.
2020	Vladinov, G. M., Foronda, C. L., Gomez, N. A. G., Wunder, L., Budhathoki, C., & Gonzalex, J. E. (2021). AneSBAR handoff rubric for nurse	This simulation study developed a handoff rubric, the Anesthesia SBAR or AneSBAR Handoff tool to assess the	Non-randomized Control Trial – Level III	Simulation Hospital	n = 34. Junior (second year) SRNAs participated in the study over the course of three days.	The Anesthesia SBAR (AneSBAR) handoff rubric was created in order to evaluate SRNAs in report. This tool is modified from the	• Unique article that focuses on SRNAs as the population of interest. • Inexperience in this clinician population may contribute to

	anesthesia students. <i>Clinical Simulation in Nursing</i>, 50(1), 102-106. https://doi.org/10.1016/j.ecns.2020.09.004	completeness of SRNA report. The purpose of this research is to create a tool that can be incorporated into clinical curriculums to prepare the next generation of CRNAs for giving thorough and accurate reports. The International Nursing Association for Clinical simulation and Learning (INACSL) Standards of Best Practice: Simulation were used to formulate the simulation. The Promoting Excelling and Reflective Learning in Simulation (PEARLS) method was used to				Interprofessional ISBAR Communication Rubric (IICR) to be made specific to anesthesia report. This handoff tool consists of 17 items. Data was evaluated via SPSS version 22 where descriptive statistics and Spearman rank correlation were performed.	increased errors in intraoperative anesthesia handoff. • Nurse anesthesia programs are required by The Council of Accreditation to ensure students can effectively communicate with intraprofessional team members and are able to properly utilize verbal/nonverbal/written communication methods in the delivery of anesthesia. However, there are no standards for training/assessment of anesthesia handoff for students. • References Suzanne Wright's PATIENT mnemonic as a comprehensive checklist. • The study relied on simulation which is an imitation of the real OR environment – this excludes the distractions, challenges, and unpredictability of
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		evaluate and debrief with each simulation scenario.					the real-world and thus results may not be completely generalizable. • The simulation study consisted of two handoffs by two students – one student that was going for “lunch break” and the handoff from the receiving SRNA when the student came back from break for “updates.” • It may be a more effective practice change strategy to implement structured report into teaching curriculums and address ineffective communication leading to omitted components of patient care during an earlier time frame in a CRNA’s career. • Despite both professional anesthesia organizations (AANA and ASA) having practice standards for anesthesia handoff,
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							there is no formal structure required. There is a lack of research surrounding this topic and it may be assumed that improved pedagogy on this topic is not necessary as practitioners have prior clinical experience as ICU RNs. • Limitations: small sample size of convenience, limited generalizability, the Hawthorne effect.
2020	Lazzara, E. H., Keebler, J. R., Simonson, R. J., Agarwala, A., & Lane-Fall, M. B. (2020). Navigating the challenges of performing anesthesia handoffs and conducting anesthesia handoff research. <i>International Anesthesiology Clinics</i>, 58(1), 32-37. https://doi.org/10.1097/AIA.0000000000000260	The purpose of this publication is to examine the various aspects of anesthesia handoff and the frequent challenges encountered, analyze the barriers to conducting intraoperative anesthesia handoff research, and offer applications for improvement of	Descriptive/Qualitative Study – Level VI	N/A	N/A	No tools or interventions noted.	• Communication errors occur approximately every 8 minutes • Errors in anesthesia handoff due to ineffective communication are associated with postoperative complications and increased mortality rates • 30% of all malpractice claims in the past five years were related to errors in

		future anesthesia handoff research. No framework or conceptual model noted.					communication, costing approximately 1.7 billion dollars. • Evidence suggests that standardizing anesthesia handoff improves patient, provider, and facility outcomes • This article acknowledges the debate between adverse outcomes and the correlation/relationship to anesthesia intraoperative handoff • Insufficient supporting literature has been published regarding curriculums incorporating standardization of anesthesia handoff. • Unique to this article, the authors introduced 3 transfer categories: 1. Shift changes, 2. Duty relief, 3. Transitions in care • What are the challenging aspects of anesthesia handoff?
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							- Transfer of care may involve traveling for imaging which adds another difficult dimension to handoff. - Anesthesia handoff often includes transferring physical equipment in addition to providing patient information and transferring responsibility (such as hemodynamic monitoring, arterial/ventral venous pressure monitoring, mechanical ventilation, vasoactive medications, vital sign monitoring, etc.). • The four areas that affect anesthesia handoff research the most are study design, heterogeneity,
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							temporality, and data reporting.
2020	Boet, S., Djokhdem, H., Leir, S. A., Théberge, I., Mansour, F., & Etherington, C. (2020). Association of intraoperative anaesthesia handovers with patient morbidity and mortality: A systematic review and meta-analysis. <i>British Journal of Anaesthesia</i> , 125(4), 605-613. https://doi.org/10.1016/j.bja.2020.05.062	The purpose of this systematic review and meta-analysis is to examine current literature to determine the impact of intraoperative anesthesia handoff on patient outcomes. The authors of this study hope to inform future research and anesthesia practice by analyzing the correlation of handoff and increased morbidity and mortality. The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) protocol was used.	Systematic review and meta-analysis – Level I	Hospital OR	n = 8. Inclusion criteria were prospective and retrospective clinical studies that examined the correlation of intraoperative anesthesia handover and patient morbidity and/or mortality. Handover included any anesthesia provider such as attendings, residents, fellows, CRNAs and SRNAs. Studies examined the patients and 2 studies examined	No standardized handoff tool used. Literature search of databases to include Medline, Medline in process, CINAHL, and Embase. Authors used the National Institutes of Health Quality Assessment Tool for Observational Cohort and Cross-sectional Studies to evaluate bias risk. Post-hoc meta-analysis examined the effect of anesthesia handoff on patient care. This analysis was performed using Review Manager 5.0. Four studies were examined in the post-hoc.	• A meta-analysis of 4 studies suggested a 40% increased risk for negative patient outcomes due to anesthesia handoff intraoperatively. • This systematic review and meta-analysis suggest that intraoperative anesthesia handoff increases morbidity and mortality for patients receiving surgery. However, there may be an opportunity to improve patient outcomes as two licensed anesthesia professionals are reviewing patient specific information in real time and can verify findings and identify errors together. • The authors of this study concluded that further research should include specific analyzation of handoff

					anesthesia care providers. 7 Studies found handover to be a negative care event whereas 1 study found that anesthesia handoff allowed the team to identify communication breakdown and errors.		characteristics and their impact on patient outcomes. - Although the studies included in this systematic review had limitations to include retrospective accounts, a lack of RCTs, and self-reported experience, the large sample size (605,678 patients) leads the authors to believe that there is a true correlation between anesthesia handoff and patient morbidity and mortality. - Limitations: Studies have inconsistent data collection and outcome definitions. Characteristics of handover in each study were not clear. Meta-analysis was only four studies.
2020	Hu, J., Yang, Y., Li, X., Yu, L., Zhou, Y., Fallacaro, M. D., & Wright, S. (2020). Adverse outcomes	Systematic review to synthesize current literature regarding the correlation	Systematic review and meta-analysis – Level I	Hospital OR	n = 7. Seven retrospective cohort studies with 680,155 patients total.	No standardized handoff tool used. Methodological quality of each study was evaluated via the	Literature suggests that the quality of handoff is critical and to avoid handing the patient off when the patient is at

	associated with intraoperative anesthesia handovers: A systematic review and meta-analysis. <i>Journal of PeriAnesthesia Nursing</i>, 35(5), 525-532. https://doi.org/10.1016/j.jopan.2020.01.016	between intraoperative anesthesia handoff and quality of patient care and patient outcomes. The results suggest every additional intraoperative handover significantly increases the odds of composite morbidity. No conceptual model or framework was used.			Of these patients, 139,362 had anesthesia handover during surgery.	Newcastle-Ottawa Scale. Meta-analysis across the studies was performed using Review Manager and an adjusted odds ratio with 95% confidence intervals were used for dichotomous variables.	high risk, unstable, or thorough handoff cannot be completed in the specified timeframe. Statistically significant relationship between intraoperative anesthesia handover and composite of morbidity. The number of handovers was not significantly associated with composite of mortality/morbidity or in-hospital mortality. Implications for future practice: quality of handoff must be enhanced to prevent error and poor patient outcomes. Critique: Included studies that were retrospective cohort studies and not randomized controlled trials. Strength: Research is generalizable - large sample size with variety of surgeries and methods of handoff.
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							• Article defines “handoff” and describes its effects on patient outcomes • 200 million patients receive general anesthesia for surgery around the world and of those patients, 40.98 million will have an anesthesia handoff occur at least once during their surgery. Meta-analysis revealed that each anesthesia handover increases the patient’s risk for morbidity by 20%. But the correlation of anesthesia handoff with composite mortality and morbidity or in-hospital mortality was statistically nonsignificant.
2019	O’Reilly-Shah, V. N., Melanson, V. G., Sullivan, C. L., Jabaley, C. S., & Lynde, G. C. (2019). Lack of association between intraoperative handoff of care and	The purpose of this study is to examine the confounding variables on composite negative patient outcomes and their	Correlationa l Design/ Controlled Cohort Study – Level IV	Hospital OR	n = 2,586 cases with anesthesia intraoperative handoff. N = 12,111 cases total.	This retrospective study examines data from the American College of Surgeons National Surgical Quality Improvement Project. 12,111 total surgeries were	• When statistically examined as a single variable, attending handoffs were associated with higher rates of adverse outcomes. However, once confounding

	postoperative complications: A retrospective observational study. <i>BMC Anesthesiology</i>, 19(182). https://doi.org/10.1186/s12871-019-0858-8	relationship to anesthesia intraoperative handoff. The American College of Surgeons National Surgical Quality Improvement Program was used.				performed between two local teaching hospitals. Confounding variables such as the presence of an attending, anesthesiologist, or resident handoff, patient age, sex, body mass index, ASA-PS, surgical case complexity, case length, and evening/weekend start time. Statistical analysis was performed in R v3.3.2 (R Core Team, Vienna, Austria) using RStudio platform v1.1.423). Chi-square test was used for sex, ASA-PS classification, evening/weekend case, surgical specialty, and the presence of a composite NSQIP negative patient event. Wilcoxon rank-sum test was used for age, BMI, and case length.	variables were included in the statistical analysis, the presence of an attending handover and complete transition of care were not statistically significant. • Surgical case length has been associated with handoffs and adverse postoperative events • Conflicting results in the literature regarding handoffs and adverse patient outcomes – This is due to differences in care models or analytic approach to confounding variables • Adverse events associated with anesthesia handoff during a surgical procedure included progressive/acute renal failure, cardiac arrest requiring CPR, stroke, surgical site infection or sepsis, myocardial infarction, unplanned intubation, mechanical
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							ventilation over 48 hours, pneumonia, DVT, venous thromboembolism, UTI, readmission within 30 days. • The results of this study suggested that anesthesia handoffs are associated with increased risk of patient morbidity and mortality when analyzed as a single variable. When all confounding variables are accounted for, handoffs are not associated with a composite measure of adverse postoperative outcomes. Comorbidities, length of case, and timing of the case (occurring on evenings or weekends) were significant contributors to the correlation between anesthesia handoff and poor patient outcomes. • The authors suggest that perhaps handoffs in anesthesia care
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							actually allow for rested personnel to resume care with heightened vigilance and decreased response time which may improve patient outcomes.
2019	Silva, J. & Arnaud, M. (2019). Improving nurse anesthetist intraoperative handoff process by developing and implementing an evidence-based, facility-specific cognitive aid. <i>Journal of Nursing & Interprofessional Leadership in Quality & Safety</i>, 2(2). https://digitalcommons.library.tmc.edu/cgi/viewcontent.cgi?article=1028&context=uthoustonjquallsafe	Purpose: improve intraoperative handoff process and ensure transfer of crucial information. Standardized intraoperative handoffs between CRNAs with an evidence-based, facility-specific memory aid demonstrated increased quality of communication and the transfer of concise and relevant clinical information during the intraoperative period.	EBP/QI Project – Level VI	Hospital OR	n = 24. Convenience sampling of 24 CRNAs working at a national cancer institute.	A focus group of five CRNAs created a facility specific cognitive aid for CRNAs providing handoffs. The institution-specific cognitive aid addressed five critical patient case points (intake and output, antibiotic administration, intravenous access, muscle relaxant administration, narcotic administration). Single sheet format. Handoff used for 4-weeks. 23 handoffs with the cognitive aid and 65 handoffs without the cognitive	• This facility identified a problem – with a new HER system, handoff relied on memory as the provider searched through the chart. Report was inconsistent and searching the chart interrupted the flow of report. • The article acknowledged that miscommunication in patient handoff creates an increased risk of errors. The authors also provided evidence in support of handoff increasing patient morbidity and mortality. • Unfamiliarity with the patient due to an incomplete report can

		No model or framework was used in this study.				aid were examined. CRNAs who used the aid were provided with a 5-question Likert-type post-intervention survey.	delay interventions in emergency. • This facility developed their own facility specific tool to use for CRNA-to-CRNA handoff. • Individual outcomes of before and after the use of cognitive aid were not measured. Study was limited in scope and time. Convenience sampling method was used. • Study results relied on surveys of individual's perception of the aid, not quantitative data. Pre-test and post-test maturation and change in the subjects must be considered. • Discusses potential to impact peri-operative handoffs inter-professionally
2019	Lee, S. C., Atkinson, M. E., Minard, C. G., & O'Brien, A. (2018). Electronic tool helps anaesthesia trainee handovers. <i>The Clinical</i>	The authors of this study hypothesized that incorporating an electronic intraoperative handoff tool	Non-randomized Control Trial – Level III	Hospital OR	n = 34. Study participants included anesthesiology residents and SRNAs.	An electronic survey was distributed to faculty in the department of anaesthesiology at a teaching facility	• This study was in part prompted by increasing resident duty hour restrictions, which increases the number of handoffs, particularly

	<i>Teacher</i>, 16(1), 58-63. https://doi.org/10.1111/tct.12768	accompanied by an educational tutorial for its use would enhance anesthesia communication and increase the number of critical components communicated during handoff. The purpose of this article was to create a comprehensive checklist and effective teaching strategy for anesthesia learners to prevent errors and improve patient outcomes.			The study observed the participants handoff to another provider without the checklist (control) and then with the checklist. Before the use of the checklist, the anesthesia trainee was given a brief tutorial on the checklist. The trainee was asked a four question survey regarding their experience with the checklist following its use.	asking members the most critical components of handoff. With the results, two faculty anaesthesiologists developed an anesthesia handoff checklist that was incorporated into the electronic medical record system (Epic) as a handover button. Components of handoff included significant medical history or labs, allergies, airway, lines reviewed, discussed last/total dose of pertinent medications, intraoperative events, neuraxial anesthesia, regional anesthesia, postoperative plans, orders, and other concerns.	during long surgical cases. • Anesthesia handoffs are more complex than a typical handoff due to competing demands for the practitioner's attention while giving report. • The authors of this study support research showing that a lack of complete communication during handoff can lead to omission of critical patient information, which can in turn lead to increased morbidity or mortality by 8%. • Study results show that the anesthesia handoff checklist improved every participant's handover in the number of components conveyed. • Without the checklist, commonly missed components included ability to mask ventilate the patient, antibiotics, vasoactive
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							medications, fluids, estimated blood loss, urine output, emergence, disposition, pain control, and the placement of postoperative orders. The most improved section of the checklist was the postoperative section, including the emergence plan, patient disposition, pain control plan, and postoperative orders. • It is also important to note that despite common perceptions, the checklist did not increase the length of time to give handoff. On the contrary, the checklist offered streamlined delivery and anesthesia trainees included more information in the same amount of time. • Limitations: participants were not randomized, the Hawthorne effect (participants may have
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							altered their behavior as they knew they were being observed). • If handoff is to be incorporated into the electronic health record it must be easy and accessible. • There may be significant benefits from adopting standardized handoff in anesthesia programs as it provides the foundation for incorporating standardized handoff into lifelong practice.
2018	Jurewicz, K., Alfred, M., Neyens, D. M., Catchpole, K., Joseph, A., & Reeves, S. T. (2018). Investigating intraoperative and intraprofessional handoffs in anesthesia. <i>Sage Journals</i>, 62(1). https://doi.org/10.1177/1541931218621107	Observational study of intraoperative and intraprofessional temporary and permanent handoffs in anesthesia. The study reported a breakdown of the last tasks performed by the current provider and the first task performed by the	Observational Study – Level VI	Hospital OR	n = 35. This study analyzed video recordings of 35 surgeries at a large medical facility in South Carolina.	No tools or interventions were used in this study.	• Handoffs ranged between 33 seconds and 7.42 minutes total. • Miscommunication can be attributed to 80% of medical errors, according to TJC. • Authors focus on interprofessional handoff – communication between CRNAs, anesthesiologists, residents, fellows, etc.

		receiving anesthesia provider. This study specifically examined handoffs that occurred during the maintenance phase of anesthesia. No framework or conceptual model used.					• An anesthesia team may be involved in as many as 120-180 handoffs each day. • Each handoff increases major in hospital morbidity or mortality by approximately 8%. • Temporary handoff is 2.61 minutes shorter than permanent handoff – there may be an increased risk of miscommunication during temporary as opposed to permanent handoffs. Temporary handoff is not as thorough as permanent handoff. • There is variability in intraoperative handoff – a standardized tool could provide a higher quality handover. But single tool may not be available due to differences between disciplines and specialties in OR. • Implications for future study: Examine
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							intraoperative handoffs in different ORs and different types of surgeries.
2018	Canale, M. L. (2018). Implementation of a standardized handoff of anesthetized patients. <i>American Association of Nurse Anesthesiology Journal</i> , 86(2).	This publication is an EBP quality improvement project that implements a standardized intraoperative handoff tool. This intervention demonstrated improved perception of safety risks, employee satisfaction, and quality and continuity of the transfer of information. TeamSTEPPS framework by the DoD. Johns Hopkins EBP model	EBP QI Project – Level VI	Hospital OR	n = 20 Active CRNAs involved in the handoff of patients at an 800-bed regional medical facility in West Central Florida. Purposive, nonprobability, snowball sampling from a convenience sample of CRNAs selected. Sample included those who worked as a CRNA for 5 years or less and spent >36 hours	Adaptation of Wright's PATIENT mnemonic implemented for 2 weeks. Adapted mnemonic was created by TeamSTEPPS change team. Preintervention Likert-type survey, education, and postintervention Likert type survey. Descriptive analysis of survey responses and thematic analysis of open-ended questions were conducted on the data. Paired t test was also performed on data.	Identifies need for standardization through results of poor communication. The author found that higher levels of quality and continuity of transfer of information, perceptions of patient safety, and healthcare worker satisfaction were reported in the postsurvey but there were no actual measurements of these variables, only reported perceptions of them. • Limited generalizability as study was conducted in 800-bed regional medical center and involved a small number of perioperative staff. • Small sample size (20 CRNAs). • Discusses a variety of themes to include

					providing anesthesia per week.		standardized communication, patient safety, employee satisfaction and adherence to EBP practice. • Identifies most critical aspect to implementing quality improvement change is buy-in from those who must make the change. • Barriers to intervention: length of report - can be tedious for experienced CRNAs. Synthesis: Relates to other literature on patient safety and the prevention of error through standardized communication.
2018	Jones, P. M., Cherry, R. A., Allen, B. N., Jenkyn, K. M. B., Shariff, S. Z., Flier, S., Vogt, K. N., & Wijeyesundera, D. N. (2018). Association between handover of anesthesia care and adverse postoperative	A retrospective cohort study that examined the correlation between intraoperative anesthesia handoff and poor patient outcomes.	Controlled cohort study – Level IV	Hospital OR	n = 313,066 adult patients who received major surgery. Patients were 18 years old and older. Surgeries lasted at a	No intervention or tool noted. Statistical analysis was performed via Stata version 15.	• Out of 313,066 adults who had major surgery, complete intraoperative anesthesia handover when compared to no handover was correlated with a significantly increased risk of a composite of

	outcomes among patients undergoing major surgery. <i>JAMA</i>, 319(2), 143-153. https://doi.org/10.1001/jama.2017.20040	No framework or conceptual model noted.			minimum of 2 hours and required a hospital overnight stay of at least one night.	all-cause mortality, hospital readmission, or postoperative complications over 30 days (44% compared to 29%). • The authors suggest that given their findings, anesthesia handover should be limited. Interesting to note that their solution to the correlation between anesthesia handover and patient morbidity and mortality is to limit handovers – this may not be possible given that anesthesia works in shifts and there is often overlap of cases between shifts, long cases require anesthesia personnel to have breaks, etc. • For every 15 patients that had an anesthesia handoff during their surgery, 1 additional patient would suffer from an adverse event postoperatively
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							• Anesthesia intraoperative handoff was also associated in increased admission to the ICU and longer length of hospital stay. • The authors note that improving the system of anesthesia handoff (mandatory anesthesia checklists) may decrease patient harm. • Limitations to this study – billing codes were used to determine exposure of complete handoff, the study was not able to determine when handoff occurred, receiving anesthesia provider experience and licensure varied, the presence of anesthesia trainees was not controlled for.
2013	Wright, S. (2013). Examining transfer of care processes in nurse anesthesia practice: Introducing the PATIENT protocol. <i>American Association of</i>	The purpose of this study is to investigate current processes for transfer of care between CRNAs and create a communication	EBP/QI Project – Level VI	Hospital OR	Phase 1 of study – 302 out of 1,000 CRNAs responded to pre-intervention survey.	Phase 1 survey asked respondents demographic questions, current handoff practices, and the 7 most important elements to include in transfer of	• 90% of the survey respondents believed that the PATIENT tool aided with memory while giving report and the length and depth of the report was appropriate. All

	<i>Nurse Anesthesiology</i>, 81(3), 225-232.	tool to improve situational awareness and quality of information transfer. No model or conceptual framework used.			Phase 2 – A convenience sample of 74 CRNAs employed at two local community hospital and one large teaching hospital in Virginia. Thirty-minute group education/orientation was provided prior to the implementation of a transfer of care checklist tool. Phase 2 took place over 2 weeks.	care handoff between CRNAs. Phase 2 – the PATIENT mnemonic was developed in response to phase 1 results: P = Patient (preoperative assessment and current condition) and positioning A = Airway (level of difficulty, current management), antibiotics, allergies, and type of anesthetic T = Temperature (including type of monitoring and warming and/or cooling adjuncts) I = Intravenous (including type of access, invasive lines, infusions, blood products) and intake and output E = End-tidal carbon dioxide (including ventilatory parameters such as	respondents agreed that the tool was an effective way to organize handoff. • The author compares the CRNA career to air traffic controllers in the transfer of responsibility. The transfer is described in phases where phase 1 is the end of the shift and phase 2 is the arrival of the receiving CRNA. Phase 3 is the meeting of the two CRNAs and phase 4 is “taking post” – where the receiving CRNA assumes care. • Uses evidence from The Joint Commission and their partnership with hospitals to create The Hand Off Communications Project in response to errors caused by miscommunication. • The author uses standards of practice established by the AANA – specifically standard VII “CRNAs
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						respiratory rate, peak inspiratory pressure, oxygenation, and ventilation mode) N = Narcotics (including those administered as well as those that the oncoming anesthetist is responsible for reconciling) T = Twitches (including type of neuromuscular monitoring and degree of paralysis).	must transfer the responsibility for care of the patient to other qualified providers in a manner which assures continuity of care and patient safety.” • As technology is growing and patient acuity is increasing, the amount of data that must be communicated is increasing accordingly. Effective communication is critical.
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(Chart adapted from Brown, S. J. (2018) *Evidence-based nursing: The research-practice connection*. (3rd ed.). Jones & Bartlett Learning.)

Note: Key to abbreviations used in chart: CRNA (certified registered nurse anesthetist), AANA (American association of nurse anesthesiologists), TJC (The Joint Commission), EBP (evidence-based practice) TeamSTEPPS (Team strategies to enhance performance and patient safety), DoD (Department of Defense), OB (obstetrics), SRNA (student registered nurse anesthetist), ASA (American Society of Anesthesiologists), PACU (post-anesthesia care unit), EHR (electronic health record), ASA-PS (American Society of Anesthesiologists Physical Status), CPR (Cardio Pulmonary Resuscitation), DVT (deep vein thrombosis), UTI (urinary

tract infection), ICU (intensive care unit); Key to Levels of Evidence: I: Systematic review/meta-analysis of randomized controlled trials (RCTs); II: RCTs; III: Nonrandomized controlled trials; IV: Controlled cohort studies; V: Uncontrolled cohort studies; VI: Descriptive or qualitative study, case studies, EBP implementation and QI; VII: Expert opinion from individuals or groups. Adapted from *Evidence-based practice in nursing and healthcare: A guide to best practice* (4th ed.), by B. M. Melnyk and E. Fineout-Overholt, 2019, p. 131. Copyright 2019 by Wolters Kluwer.

Appendix D: Project Approval Processes

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Human Subject Research Determination Form

This form should be completed and submitted for review by the service lines impacted by the work prior to project initiation (including, but not limited to, collection or analysis of baseline data). Projects that are "Not Human Subjects Research" are not required to submit an IRB application in ePirate. To help make that determination, you may utilize the [Decision Chart](#) provided by the Office for Human Research Protections along with this worksheet. For any project where there is a question as to whether it qualifies as Quality Improvement or Research, or if certification of "Not Human Subjects Research" is needed for publication, please route to the UMCIRB office via email: umcirb@ecu.edu.

Please check the [Office of Clinical Research Website](#) or [UMCIRB website](#) to make sure that you have the most recent version of this form.

Project Title	Implementation of a Standardized Handoff Report for Nurse Anesthetists in the Intra-Operative Setting: A Quality Improvement Project
Project Leader	Grace Mook
Project Leader Contact E-mail	[REDACTED]
Department or Unit Affiliation	Anesthesia
Project Advisor (if applicable)¹	Maura McAuliffe, CRNA, PhD, FAAN

Additional Faculty, Staff, and Trainees Involved (add more rows if needed):

Name	Department or Unit	Role	Check this box if this team member will access PHI or PII for the purposes of this project.
			☐
			☐
			☐
			☐
			☐
			☐
			☐
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			☐
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¹ All student, resident, and fellow projects must have a faculty or unit leader designated as the advisor for the project.

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Please answer the following questions to the best of your ability. If the answers to these questions change during the course of the project, please resubmit this form for review:

End Goal / Desired Outcome:

[The purpose of this quality improvement project is to assess anesthesia providers' perceptions of adequacy of a newly developed quick-reference guide addressing standardized intraoperative anesthesia handoff report.

The quick-reference guide known as the "PATIENT" mnemonic addressing standardized intraoperative anesthesia handoff report has been developed based upon accepted national guidelines. Anesthesia providers at [REDACTED] will be administered a pre-survey asking about their familiarity with the/their current practice with the PATIENT mnemonic including perceptions of adequacy and frequency of use. Then, a quick-reference guide addressing standardized intraoperative anesthesia handoff report will be made available to them, and they will be asked to use the guide for two weeks. Upon completion of the two-week utilization period, they will be asked to complete a post-survey about their perceptions of the adequacy of the guide. Qualtrics survey software will be used to gather data. No patient information will be recorded or maintained during this project.]

Methodology / Intervention:

[The project will consist of a single Plan, Do, Study, Act cycle using a pre- and post-intervention survey design. The intervention for this project will be a newly created informational tool/quick reference guide focused on standardized intraoperative anesthesia handoff report, which is based on current evidence and falls within current accepted practice standards within the facility. CRNA participants will be contacted via email and asked to complete a pre-survey and then utilize an informational tool/quick reference guide based on current evidence that aligns with practices currently accepted within the facility to support their practice regarding standardized intraoperative anesthesia handoff report. After two weeks they will then be asked to complete a post-survey addressing their perceptions of the intervention and their own practice. The project lead will be available electronically, by phone, or in person to consult with participants as needed.]

Data to be collected:

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[Data will be gathered directly from participants through completion of Qualtrics pre- and post-surveys delivered and completed electronically.
Aside from participant emails, no identifiable data will be gathered. Data of interest is participant opinions and perceptions of practice and the newly developed informational tool.
All data will be gathered using Qualtrics survey software then transferred to Excel for analysis. The only identifying information will be email addresses. Qualtrics survey software is accessed through ECU and involves multifactorial password protection. Data in Excel will be on a password protected spreadsheet and laptop. Email addresses will be deleted from Excel files after both surveys are completed and analysis of results begins. No PHI will be collected for this project. Data will be stored in Qualtrics and in Excel files (de-identified) until student graduation, anticipated to be spring of 2025. The deidentified data will be analyzed with results shared via a poster presentation to the ECU Nurse Anesthesia Program students and faculty, with participants invited to view the presentation remotely. If requested, a presentation of results to the participating department will be provided. Additionally, analysis of results will be addressed in a DNP Project Paper, completion of which is required for program graduation. This paper will be posted in the ECU digital repository, The Scholarship.]

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Complete the following questions to guide leadership's determination of this project's status:

	True	False
The PRIMARY purpose of the proposed activity or project is limited to: - implementing a standard practice to improve the quality of patient care and to collect data regarding that implementation for clinical, practical, or administrative purposes, and/or - delivering healthcare and measuring and reporting provider performance data for clinical, practical, or administrative uses.	✓	☐
The activity or project would be carried out even if there was <u>no</u> possibility of publication in a journal or presentation at an academic meeting.	✓	☐
The activity or project falls under well-accepted care practices/guidelines and are designed to bring about immediate improvements in health delivery or quality of care. If "true" and the project is related to clinical activity, please provide a citation below as evidence that project activities fall within standards of care. Projects <u>not</u> directly related to clinical activity, such as medical education, do not need to provide a citation. Canale, M. L. (2018). Implementation of a standardized handoff of anesthetized patients. <i>American Association of Nurse Anesthesiology Journal</i>, 86(2), 137-145.	✓	☐
The activity or project involves "no more than minimal risk" procedures. (i.e., the probability and magnitude of harm or discomfort anticipated are not greater in and of themselves than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests).	✓	☐

Please submit this form to your supervisor (or designee) for review and approval. Signature on this form certifies that that the below individual is in support of this project taking place and agrees with the project leader's answers to the above questions:

Supervisor's Name	
-------------------	--

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Signature	DocuSigned by: [Redacted Signature]
Date	3/5/2024 10:58 AM EST

For Project Leaders: From the list below, please check the boxes for each service line where interventions may take place or where data may be collected. For each selected area, please route for signature for both the physician leader and administrator (preferably via [DocuSign](#)). Send a completed copy of the form to qualityimprovement@ecu.edu.

For Service Line Leaders: Signature on this form certifies that you are in support of this project taking place and agree with the answers to the above questions. If you are not in support of the proposed project, please discuss with the project leader, supervisor, and UMCIRB as needed.

SERVICE LINE	SIGNATORY
☐ Heart & Vascular (Interventional Cardiology, Electrophysiology, Cardiac Surgery, Advanced Heart Failure, Cardiac Critical Care, Vascular Surgery, Cardio pulmonary rehab, Structural heart, & Thoracic Surgery)	[Redacted Signature] [Redacted Signature]
☐ Cancer (Breast cancer, Lung cancer, Gynecologic cancer, hematology, GI cancer, Urologic cancer, and Head & Neck cancer)	[Redacted Signature] [Redacted Signature]
☐ Neuro Sciences (Neurology, Neurosurgery, Neuro Degenerative Disease, Neuro Critical Care, Stroke, Neuro Radiology, & Spine)	[Redacted Signature] [Redacted Signature]
☐ Orthopedics (Joints, Orthopedic Surgery, Rheumatology, Sports medicine, Orthopedic medicine, & Orthopedic Trauma)	[Redacted Signature] [Redacted Signature]
☐ Behavioral Health (Child / Adolescent Psychiatry, Behavioral medicine, & Adult Psychiatry)	[Redacted Signature] [Redacted Signature]
☐ Primary Care (Family medicine, Med-Peds, General Internal Medicine, Palliative Care, Geriatrics, & Sleep Medicine)	[Redacted Signature]

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☐	Children's Health (Pediatric Surgery, General Pediatrics, Well Newborn, Newborn & Pediatric Critical Care, Pediatric Hem-Onc, Neonatology, Pediatric medicine, Medicine subspecialties, surgical subspecialties)	_____ _____ _____ _____
☐	Women's Health (Gynecology, Obstetrics, & Maternal Fetal Medicine)	_____ _____
☐	Emergency Services (Emergency Preparedness, Emergency Management, & Emergency Services)	_____ _____ _____
☐	Physical Medicine & Rehab (Rehab, Therapy (OT, PT, SLP), Pain, Wound Care, & Audiology)	_____ _____
☒	Adult Surgical Service (Anesthesiology, Trauma, ENT, Benign Urology, Plastics, Ophthalmology, Transplant Surgery, & Acute Care Surgery)	DocuSigned by: _____ _____ DocuSigned by: _____ _____
☐	Adult Medicine (Medical Critical Care, Infectious Disease, Hospital Medicine, Pulmonology, Endocrinology, Allergy, Dermatology, & Nephrology)	_____
☐	Radiology	_____ _____ _____
☐	Pathology & Lab Services	_____

DocuSign Envelope ID: 02883EBB-9279-4505-8B47-7E817FF12FC9

Optional Determination:

For any project where there is a question as to whether it qualifies as Quality Improvement or Research, or if certification of "Not Human Subjects Research" is needed for publication, please route to the UMCIRB office via email: umcirb@ecu.edu.

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

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

UMCIRB Office Staff Signature: _____ Date: 3/14/2024

The UMCIRB office will contact you if any further information is needed to make this determination. Please note that if the UMCIRB office determines the activity is not human subjects research, then any presentation, publication, etc. should not refer to the activity as such.

Appendix E: Collaborative Institute Training (CITI) Modules**Human Research Group 1 – All Biomedical Investigators and Key Personnel**

Completion Date 27-Oct-2023
Expiration Date 27-Oct-2026
Record ID 59331518

This is to certify that:

Grace Elizabeth Mook

Has completed the following CITI Program course:

Not valid for renewal of
certification through CME.

Human Research
(Curriculum Group)
Group 1.All Biomedical Investigators and Key Personnel
(Course Learner Group)
1 - Basic Course
(Stage)

Under requirements set by:

East Carolina University

CITI
Collaborative Institutional Training Initiative

101 NE 3rd Avenue, Suite 320
Fort Lauderdale, FL 33301 US
www.citiprogram.org

Generated on 11-Feb-2024. Verify at www.citiprogram.org/verify/?w9b03ef3e-b264-4cb0-91b8-53469b1e5e0f-59331518

Responsible Conduct of Research – Biomedical Responsible Conduct of Research Course 1

Completion Date 27-Oct-2023
Expiration Date 27-Oct-2026
Record ID 59331519

This is to certify that:

Grace Elizabeth Mook

Has completed the following CITI Program course:

Not valid for renewal of
certification through CME.

Responsible Conduct of Research
(Curriculum Group)
Biomedical Responsible Conduct of Research Course 1.
(Course Learner Group)
1 - Basic Course
(Stage)

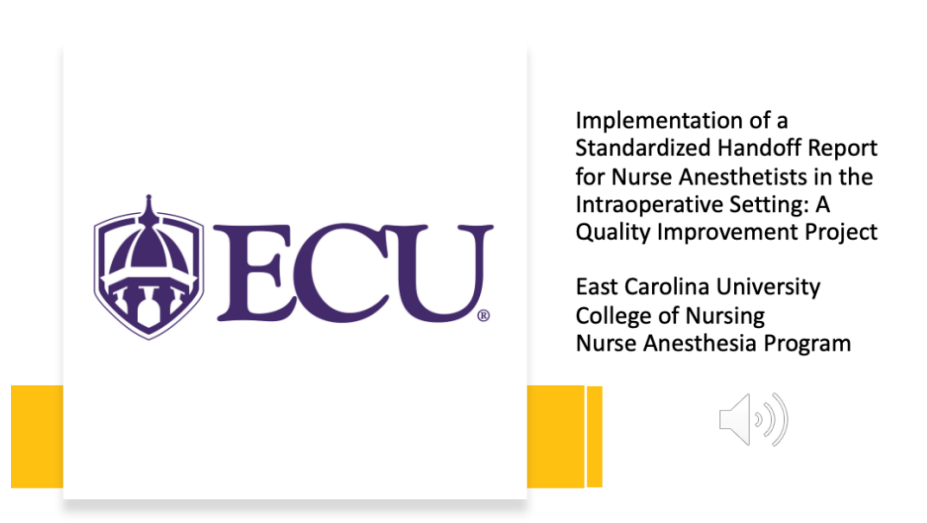
Under requirements set by:

East Carolina University

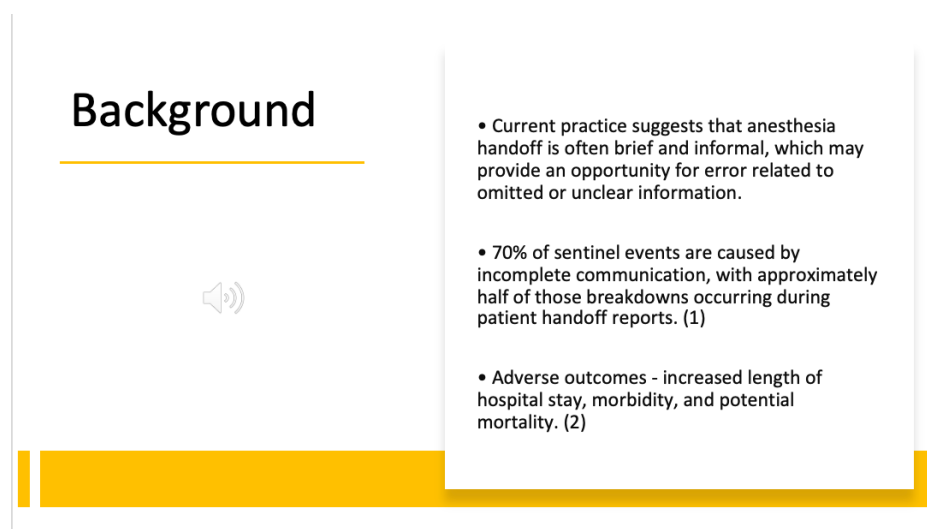
CITI
Collaborative Institutional Training Initiative

101 NE 3rd Avenue, Suite 320
Fort Lauderdale, FL 33301 US
www.citiprogram.org

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Appendix F: Educational PowerPoint

Slide 1 Transcript: *Hello, my name is Grace Mook, and I am Student Registered Nurse Anesthetist in the Nurse Anesthesia Program at East Carolina University obtaining my Doctor of Nursing Practice Degree. I would like to begin by thanking you in advance for your time and agreeing to participate in this study.*



Slide 2 Transcript: *To build the foundation for this DNP project, we examined current literature and found that most anesthesia handoffs are often brief and informal, which may provide an opportunity for error related to omitted or unclear information. According to Michelle Canale's article "implementation of a standardized handoff of anesthetized patients" published in the American Association of Nurse Anesthesiology Journal, 70% of sentinel events are caused by incomplete communication, with approximately half of those breakdowns occurring during patient handoff reports. Literature also suggests that adverse outcomes of inadequate handover*

include increased length of hospital stay, increased morbidity, and potential mortality (Hu et al, 2020).

Purpose of this project



- **Purpose:** To assess anesthesia providers' perceptions of adequacy of the PATIENT mnemonic to facilitate standardized handoffs of anesthetized patients.

- **Goal:** To gain a better understanding of CRNA perceptions of this method in order to assess its usefulness as a handoff checklist in the transfer of care

Slide 3 Transcript: Numerous research studies have consistently demonstrated elevated provider satisfaction, enhanced completeness of handoff interactions, and increased perceived effectiveness of the handoff process through the incorporation of mnemonic checklists in intraoperative handoffs. Supporting this, the American Association of Nurse Anesthetists (AANA) published an article reporting an exploratory study involving 1000 anesthesia providers who utilized the PATIENT mnemonic tool. Remarkably, 87% of the participants expressed a favorable inclination towards the adoption of a standardized transfer of care process when giving or receiving reports for anesthetized patients (Wright, 2013). This quality improvement project seeks to better understand [REDACTED] CRNAs perceptions of the adequacy of the PATIENT mnemonic in facilitating standardized handoffs of anesthetized patients.

P – Procedure: Patient (quick scan):	Preop assessment and current condition Position: Pacemaker: Type of anesthetic/medications
A – Anesthesia: Antibiotic: Airway: Allergies:	Level of difficulty and current management
T – Temperature:	Includes type of monitoring and warming devices
I – IVs/invasive lines:	Type of access, infusions, blood products, I and O's
E – ETCO2 (ventilation):	Vent parameters, RR, PIP, O2 level, and vent mode
N – Narcotics:	Those given, and those needing to be reconciled.
T – Twitches	Neuromuscular monitoring, degree of paralysis

Modified PATIENT Mnemonic (Canale, 2018)

PATIENT mnemonic



Slide 4 Transcript: The PATIENT Mnemonic was developed by a PhD and CRNA Suzanne Wright to help facilitate effective communication between anesthesia providers during patient

hand-off. A comprehensive and cohesive report detailing the Patient, Procedure, Allergies, Antibiotics, Anesthetic Technique, Airway Management, Temperature Regulation, IV Access and Invasive Lines, End Tidal Carbon Dioxide, Narcotics the patient has received, and Twitches if the patient is receiving muscle relaxants, can the receiving anesthesia provider with the necessary information to deliver outstanding care. If you wish to utilize the PATIENT Mnemonic, laminated “Badge Buddies” are available to attach to your Employee ID badge reel for convenient access reference. One will be left in your Anesthesia Workroom Mailbox.

**Suzanne Wright, PhD,
CRNA, CPPS, CHSE,
FAANA
Creator of the
PATIENT mnemonic**



Slide 5 Transcript: This slide provides a little more background on the author of the PATIENT mnemonic. Suzanne Wright is a CRNA who graduated with her PhD in Health-Related Sciences from Virginia Commonwealth University, and as of 2021 is a Fellow of the American Association of Nurse Anesthetists. She is also a Certified Professional in Patient Safety through the Institute of Healthcare Improvement and a Certified Healthcare Simulation Educator through the Society for Simulation in Healthcare. She has published three articles from 2011 to 2015 on the topics of patient safety, transfer of care, and situational awareness in student registered nurse anesthetists and has co-authored many more articles since then. She previously served as the director of doctoral education for the department of nurse anesthesia at Virginia Commonwealth University and is currently serving as the dean for the school of nursing at Old Dominion University.

Process



Step 1: CRNA completes the pre-implementation assessment using Qualtrics (approximately 10 minutes or less)



Step 2: CRNA uses modified PATIENT mnemonic badge buddy for intraoperative anesthesia handoff for breaks >15 minutes for 2 weeks



Step 3: CRNA completes the post-implementation assessment using Qualtrics (approximately 10 minutes or less)

Slide 6 Transcript: *The first step as a volunteer will be completing the pre-implementation assessment via Qualtrics. This pre-implementation assessment will have you answer 10 questions to gather information regarding your personal experience with intraoperative handoffs. This assessment consists of 4 yes/no questions, 5 Likert scale questions, and 1 “select all that apply” question. The entire pre-implementation assessment should take less than 10 minutes to complete. The second step in this project is actually implementing the use of the PATIENT mnemonic in your intraoperative handoffs to other anesthesia providers. You should strive to utilize the PATIENT mnemonic whenever giving handoff report for a break that is at least 15 minutes. The implementation period for the PATIENT mnemonic will last 2 weeks. The final step in this project is collecting post-implementation data via completion of a Qualtrics survey. This survey consists of 13 questions that evaluate your personal experience with the PATIENT mnemonic and any recommendations you have to improve upon the handoff tool or project itself.*

Contact information

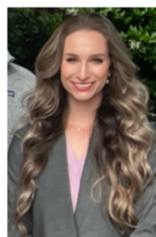
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Slide 7 Transcript: *My project chair is Dr. Maura McAuliffe. If at any point you have questions or concerns about the mechanics of the project, or about how to utilize this tool, please do not hesitate to contact us.*



**Thank
you!**

Slide 8 Transcript: *Thank you again for taking the time to help me with this quality improvement project to fulfill the requirements of my DNP.*

References

1. Canale, M. L. (2018). Implementation of a standardized handoff of anesthetized patients. *American Association of Nurse Anesthesiology Journal*, 86(2), 137-145.
2. Hu, J., Yang, Y., Li, X., Yu, L., Zhou, Y., Fallacaro, M. D., & Wright, S. (2020). Adverse outcomes associated with intraoperative anesthesia handovers: A systematic review and meta-analysis. *Journal of PeriAnesthesia Nursing*, 35(5), 525-535. <https://doi.org/10.1016/j.jopan.2020.01.016>
3. Wright, S. (2013). Examining transfer of care processes in nurse anesthesia practice: Introducing the PATIENT protocol. *American Association of Nurse Anesthesiology*, 81(3), 225-232.

Slide 9 Transcript: *References*

Appendix G: Intervention Tool**PATIENT MNEMONIC HANDOFF CHECKLIST****P** - Patient, Procedure, Position**A** - Allergies, Airway, Anesthesia, Antibiotics**T** - Temperature**I** - IVs and Invasive Lines**E** - EtCO₂ (ventilation)**N** - Narcotics**T** - Twitches

Modified PATIENT Mnemonic (Canale, 2018)

Appendix H: Qualtrics Survey Questions

Demographics:

1) How many years have you been practicing as a CRNA?

≤ 5 years

6-10 years

11-15 years

≥16 years

CRNA Pre-Implementation Survey

2) Do you currently use a systematic way (something you do for all cases) of providing report to receiving anesthesia providers prior to lunch break or change of shift?

Yes

No

3) Do all anesthesia providers in your department use a common “standardized handoff tool/checklist/mnemonic” to provide report to receiving anesthesia providers?

Yes

No

4) Were you familiar with Wright’s PATIENT mnemonic as an intraoperative anesthesia handoff tool prior to this quality improvement project?

Yes

No

Please select the answer that best describes the extent to which you disagree or agree with the following statements regarding the transfer of patient care between anesthesia providers:

5) My current handoff process provides an efficient way of transferring information:

Strongly Disagree

Disagree

Neutral

Agree

Strongly Agree

6) My current handoff process provides a comprehensive way of transferring information:

Strongly Disagree

Disagree

Neutral

Agree

Strongly Agree

7) I am satisfied with the transfer of care process I currently use:

Strongly Disagree

Disagree

Neutral

Agree

Strongly Agree

8) My current handoff process lends itself to communication errors:

Strongly Disagree

Disagree

Neutral

Agree

Strongly Agree

9) I have previously received an anesthesia handoff report that could have been more comprehensive:

Strongly Disagree Disagree Neutral Agree Strongly Agree

10) Using a standardized anesthesia handoff tool could improve completeness of CRNA reports:

Strongly Disagree Disagree Neutral Agree Strongly Agree

11) Choose all that apply: What factors influence your current handoff practices?

☐ None ☐ Type of Case ☐ Length of Case ☐ Experience of receiving CRNA ☐ Other

12) If you answered "other" to the question above, please explain:

CRNA Post-Implementation Survey

1) Over the past two weeks, how many times did you use the PATIENT mnemonic handoff tool when transferring care to a receiving anesthesia provider? _____

I found the PATIENT mnemonic handoff tool:

2) Easy to use:

Strongly Disagree Disagree Neutral Agree Strongly Agree

3) A more efficient way of organizing the material to communicate:

Strongly Disagree Disagree Neutral Agree Strongly Agree

4) A more comprehensive way of organizing the material to communicate:

Strongly Disagree Disagree Neutral Agree Strongly Agree

5) Appropriate in length:

Strongly Disagree Disagree Neutral Agree Strongly Agree

6) More time consuming than my previous handoff method:

Strongly Disagree Disagree Neutral Agree Strongly Agree

7) Lends itself to communication errors:

Strongly Disagree Disagree Neutral Agree Strongly Agree

8) Overall, I was _____ using the PATIENT mnemonic handoff tool:

Very Dissatisfied Dissatisfied Neutral Satisfied Very Satisfied

9) Please comment on why you would or would not like to adopt the PATIENT mnemonic handoff tool into your personal anesthesia practice.

10) Please describe anything you would change about the PATIENT mnemonic handoff tool.

11) Do you think it would be helpful if the department created a department specific handoff mnemonic tool?

Yes No

12) Are there any barriers that would prevent you from adopting a standardized handoff mnemonic? _____

13) What is your level of support for your future use of the PATIENT mnemonic handoff tool?

Low Medium High