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Improving Nurse Anesthetist Intraoperative Handoff Process by Developing and Implementing an Evidence-Based, Facility-Specific Cognitive Aid

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Improving Nurse Anesthetist Intraoperative Handoff Process by Developing and Implementing an Evidence-Based, Facility-Specific Cognitive Aid

Abstract

Miscommunication or non-transfer of pertinent patient information during intraoperative handoffs between anesthesia providers creates patient safety risks. An evidence-based facility-specific cognitive aid was developed and introduced to nurse anesthetists in an anesthesiology department of a large academic hospital with the aim of improving the intraoperative patient handoff process. The program used a handoff cognitive aid that addressed five pertinent patient information points. A secondary measure was evaluation of provider satisfaction. Twenty-four nurse anesthetists utilized the handoff cognitive aid during handoffs in the course of a 4-week pilot program. Eighty-eight nurse anesthetist handoffs were observed (23 with and 65 without the cognitive aid). Statistically significant improvement in the transmission of 3 of the 5 measured elements occurred when the cognitive aid was used. These areas included: intake and output (95.6% vs. 70.7%, $p = 0.018$); antibiotic administration (95.6% vs. 73.8%, $p = 0.033$); and intravenous access (100% vs. 76.9%, $p = 0.009$). An additional area that reached statistical significance (78.2% vs. 41.5%, $p = 0.003$) was the transmission of all 5 elements when the handoff cognitive aid was utilized in the handoff. In a post-implementation survey, nurse anesthetists utilizing the cognitive aid overwhelmingly agreed that the handoff cognitive aid was easy to use, contained appropriate content, and minimized risks to patient safety. Incorporation of a cognitive aid to standardize intraoperative handoffs was well received and improved communication of pertinent patient information during handoffs between nurse anesthetists.

Keywords

Handoff, Anesthesia, Patient Safety, Cognitive Aid, Nurse Anesthetist

Cover Page Footnote

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Introduction

The Certified Registered Nurse Anesthetist (nurse anesthetist) is responsible for patient care during a large portion of the perioperative period. This includes a preoperative anesthesia evaluation, intraoperative management during surgical procedures, and postoperative pain control. This time period can extend many hours, depending on the surgical procedure. The possibility of transfer of patient care between providers, or handoff, can occur at any point during this timeframe. Inadequate transfer of care by anesthesia providers during the intraoperative period creates the potential for unfavorable patient outcomes (Choromanski, Frederick, Mckelvey, & Wang, 2014). During an anesthetic and surgical procedure, the patient is usually positioned under sterile drapes, often making physical assessment unfeasible and patient interviews impossible. Patient information, during an anesthetic handoff, comes directly from the previous provider and the patient's chart. The accurate relay of pertinent patient, surgical, and anesthetic information between providers during a handoff is required to ensure safe care.

Problem

Implementation of a new electronic medical record (EMR) at this institution resulted in changes to practice, specifically the loss of a previously printable pre-operative evaluation that was often utilized in the handoff process. We identified the lack of a standardized handoff tool as an area for a process improvement project. The new system resulted in change to the handoff process between nurse anesthetists in the operating room requiring providers to obtain handoff information by searching the electronic health record and placing increased reliance on recalling information from memory. The previously used printed sheet provided a baseline amount of past medical information, including lab results, cardiac tests, and past anesthetic history. The updated EMR required multiple mouse clicks to obtain the same information. There became an increase in the variation of information reported during the handoffs among the large group nurse anesthetists. Providers that preferred to have the information written down were left using a blank sheet of printer paper on which to place their notes.

Specific Aims of Project

The aim of this quality improvement project was to improve the transfer of critical elements during the handoff process by incorporating a standardized approach using a cognitive aid during the handoff of care between nurse anesthetist providers.

Available knowledge

The Institute of Medicine (2001) identified inadequate handoffs as a key factor that impacts patient safety. Increases in patient morbidity and mortality have been linked to intraoperative handoffs (Hudson, McDonald, Hudson, Tran, & Boodhwani, 2015; Saager et al., 2014). Patient handoffs between anesthesia providers in many institutions are inevitable. When breaks and shift changes during lengthy surgical procedures are taken into account, there could be multiple intraoperative handoffs occurring daily with each one representing a potential event that could adversely affect patient outcomes. Pertinent information left untransmitted among providers could potentially impact patient safety during a surgical case or emergence from anesthesia. The location and status of critical patient lifelines during the intraoperative period, such as vascular access and airway management devices, should also be relayed during the handoff process. If there is a problem with the infusion of fluids or medications through the existing vascular access, the provider must trouble shoot the issue to ensure the line is functional. Unfamiliarity could prolong the trouble-shooting process, resulting in a delay of blood transfusions or vasoactive medications required during the case. The same issue applies to airway management devices in patients who may be positioned prone, lateral or with the head 180 degrees away from the anesthesia provider.

The National Patient Safety Guideline 2E recommends the implementation of a standardized handoff to increase effective communication (The Joint Commission, 2007). Intraoperative handoffs should contain patient focused, anesthesia specific considerations. These handoffs typically focus on

major comorbidities, airway management, pain management treatment modalities, and hemodynamic stability. Standardized guidelines for intraoperative handoffs between anesthesia providers do not exist (Wright, 2013). The use of an intraoperative checklist has been shown to increase the ability to recall specific medications and intraoperative events following a handoff (Agarwala, Firth, Albrecht, Warren, & Musch, 2015).

Wright (2013) conducted a survey of nurse anesthetists to identify items that were the most important to communicate from one anesthesia provider to another. The results from most responses to least responses were: patient medical/surgical history, allergies, ease of intubation/ventilation, intake and output, information about narcotic administration, surgical procedure, vascular access, ventilator status, status of paralysis, anesthetic type, antibiotic administration, antiemetic administration, and information on temperature. Pukenas et al. (2014) described additional pertinent items included in a handoff, such as endotracheal tube size, last dose of antibiotics, type of vascular access, size of vascular access, and location of vascular access. Additionally, Wright (2013) inquired about factors that might promote a change in the providers' handoff practice. The top results were increase in patient safety, providing a quick orientation to the ongoing case and the patient condition, ease of use, and organization of important patient information.

Methods

Context

The center in which the handoff initiative took place is a National Cancer Institute designated comprehensive cancer center in the southern United States. The center employs 97 nurse anesthetists who were impacted by the implementation of a new EMR in the institution that changed how the group provided intraoperative handoffs. The culture of the organization supports process changes through quality improvement initiatives.

Intervention

Development of the handoff aid.

Standardized handoff aid content and design was based on evidence from a review of the literature. Following review of the literature and approval by the institutional quality assessment review board, a focus group of five nurse anesthetists participated in the development of an institution-specific cognitive aid for nurse anesthetists when providing handoffs. The goal was to create a single sheet aid formatted to include common elements of an anesthesia providers' handoff that was easy to use and allowed space for free text. The focus group agreed upon a final version of the content and layout. The single sheet contained a prepopulated list of common allergies and patient medical diagnoses that could be circled. Common medications were listed with a space for the medication dosage and reminders for antibiotic redosing during the surgical case (Appendix A). The handoff cognitive aid format, ease of use, and generalizability to common anesthetic cases was a major consideration during development.

The twenty-four nurse anesthetists were instructed in the use the handoff cognitive aid for all patient handoffs (breaks, lunch, and end-of-shift handoffs) in the main operating rooms. The nurse anesthetists of this intervention group were trained to use the handoff cognitive aid and were also provided with a brief, standardized education on the importance of a quality handoff process to enhance patient safety. The nurse anesthetists were instructed to provide report in their usual fashion and review the cognitive aid with the incoming provider during the handoff to ensure that all the information on the cognitive aid was included during the handoff. The use of the cognitive aid added an additional aspect of the information sharing between the two providers. The simultaneous review of the anesthesia case was designed to create a replicable flow of the handoff. The cognitive aid was intended to help with the providers' handoff process and not to limit their current process. Providers were instructed to fill out the information on the cognitive aid with the applicable items during the case. The cognitive aid was used by the implementation group for a four-week period, allowing time for the providers to evaluate the aid's incorporation into the current workflow.

Measures

An observation group of eleven nurse anesthetists facilitated study of the intervention's impact on the handoff process by recording if five elements were communicated during all handoffs received. The five elements deemed critical by the focus group were: intake and output, size and location of vascular access, antibiotic administration, muscle relaxant administration, and narcotic administration. Using an assessment tool, these nurse anesthetists receiving patient handoffs, recorded if each of the five critical elements were discussed during the handoff process. This assessment data was collected anonymously so the providers giving the handoffs were not identified or biased.

Two weeks following the implementation of the pilot program, the twenty-four nurse anesthetists that utilized the cognitive aid were surveyed to evaluate their opinion of the handoff cognitive aid and changes in the handoff process. This five-question Likert-type survey was conducted using an electronic program (Qualtrics®).

Analysis

Statistical analysis determined if there was a statistically significant difference in the communication of the five specified critical elements between nurse anesthetist handoffs using the cognitive aid and in handoffs not incorporating the cognitive aid. A two-tailed Fischer's exact test was used to analyze data collected on the anesthesia observation sheet. The statistical method was used to compare handoffs with and without the cognitive aid and the communication of the five elements. Any intraoperative handoff report that included all five critical elements was considered a "complete" handoff. A p -value < 0.05 was considered statistically significant.

Results

During the pilot program period, a total of 88 handoffs were evaluated (23 handoffs with the cognitive aid and 65 without the cognitive aid). Table 1 provides an overview of data obtained during the program. Data from this pilot quality improvement program demonstrated a statistically significant

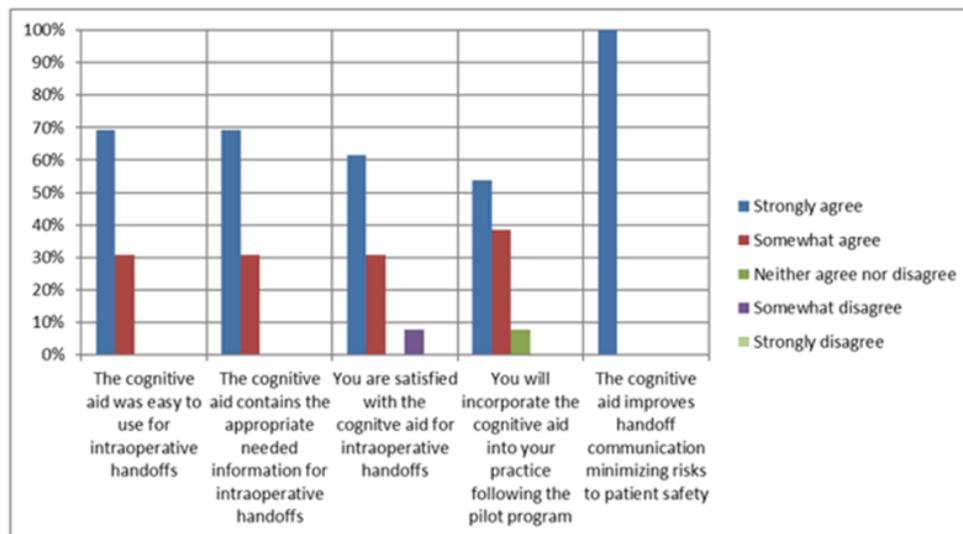
Table 1. Handoff observation results

| | Cognitive aid used | | Cognitive aid not used | | <i>p</i> -value |
|----------------------|--------------------|------------|------------------------|------------|-----------------|
| | Total | Percentage | Total | Percentage | |
| Handoff observations | 23 | | 65 | | |
| I&O | 22 | 95.6 | 46 | 70.7 | 0.018 |
| Muscle Relaxant | 18 | 78.2 | 40 | 61.5 | 0.202 |
| Antibiotics | 22 | 95.6 | 48 | 73.8 | 0.033 |
| Narcotics | 20 | 86.9 | 51 | 78.4 | 0.541 |
| I.V. site | 23 | 100 | 50 | 76.9 | 0.009 |
| All 5 Elements | 18 | 78.2 | 27 | 41.5 | 0.003 |

($p=0.003$) number of handoffs that included all five of the critical elements when the handoff cognitive aid was used 18 of 23 handoffs (78.2%) compared to when no cognitive aid was used, 27 of 65 handoffs (41.5%). This also represents an 88.4% increase in the communication of all five critical elements ("complete handoffs") by nurse anesthetists when the handoff cognitive aid was used. Statistically significant improvement in the transmission of 3 of the 5 critical elements occurred when the cognitive aid was used. These areas included: Intake and output (95.6% vs. 70.7%, $p = 0.018$); antibiotic administration (95.6% vs. 73.8%, $p = 0.033$); and intravenous access (100% vs. 76.9%, $p = 0.009$). With regard to the elements of muscle relaxant dosing and opioid dosing, the handoff cognitive aid did not provide statistically significant improvement in transmission of these elements.

Individuals that used the cognitive aid for handoffs were surveyed to assess satisfaction with the handoff cognitive aid in practice. [See Table 2 for results of the survey.] 100% of providers using the handoff cognitive aid agreed that the handoff cognitive aid was easy to use and contained the appropriate needed items for handoff. While not all providers were satisfied with the handoff cognitive aid, most agreed that they would incorporate the handoff cognitive aid in practice. All providers strongly agreed that the handoff cognitive aid improves handoff communication and minimizes patient safety risks.

Table 2. Handoff cognitive aid satisfaction



Discussion

Summary

The results of this pilot program suggest that an evidence-based, institutionally-specific handoff cognitive aid enhances the transmissibility of patient and case information among anesthesia providers during handoff processes. The ability of the handoff cognitive aid to increase the number of items consistently communicated between providers allows a more thorough handoff of information and may decrease patient safety risk due to non-transmitted information. Interestingly, while the communication of three of the five elements of critical information achieved statistical significance using the handoff cognitive aid, there were two elements (narcotic dosing and muscle relaxant dosing) that did not approach statistical significance for transmission. Further investigation into those areas is certainly warranted. Most providers that utilized the handoff cognitive aid were clearly satisfied with the handoff cognitive aid and its utility. This would certainly enhance the sustainability of the program on a longer-term basis.

Limitations

There are limitations that prevent generalizability of the handoff cognitive aid to other areas of practice. The design of this program/study lacks the ability to measure the before and after outcomes of individual providers. The observer interpretations may not be identical to another observer which may affect inter-rater reliability, which was not examined in the quality improvement program. Despite potential design issues, similar outcomes on intraoperative handoff communication are expected if the principles of this pilot program are applied to other anesthesia practices that lack a standardized handoff process. It is also important to note that this program was limited in scope and time. As such, sustainability and continued success of the program on a long-term basis cannot be implied.

Dissemination

Following the pilot program, the results of this quality initiative were disseminated to the nurse anesthesia providers and the medical director of the pre-operative area and post-operative anesthesia care unit. A decision was made to implement a cognitive aid into everyday practice by the anesthesia group. Collaborative, interprofessional adjustments to the cognitive aid were made, allowing the cognitive aid to be used for pre-operative, intraoperative and postoperative provider handoffs. The newly designed aid included a previously established preoperative checklist with the new addition of a space to document preoperative medication administration. The back of the cognitive aid provided an updated layout of the medications and patient information based on post-program feedback.

Conclusion

The development and implementation of an intraoperative handoff cognitive aid for nurse anesthetist handoffs was successfully piloted and implemented. The standardization of intraoperative handoffs between nurse anesthetists with an evidence-based, facility-specific cognitive aid improved communication expectations and the transmission of pertinent clinical information during the demanding intraoperative period. The success of this initiative established the basis for the development and interprofessional utilization of a handoff cognitive aid across the perioperative period.

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APPENDIX A

Handoff Cognitive Aid

Surgery _____

Pre-op VS

B/P _____ HR _____ O₂sat _____ Glucose _____

Allergies-(Circle) NKDA PCN SULFA LATEX Other _____

HX- (circle) HTN CAD COPD DM Hypothyroid Hep C HIV

Sleep Apnea—CPAP Y /N

Chemo XRT Other HX _____

Significant AM Meds taken

Past Surgery _____

Anti-hypertensives _____

I.V. #1 _____ Gauge— Location _____

Bronchodilators _____

#2 _____ Gauge— Location _____

Thyroid replacement _____

Aline Location _____

Narcotics _____

Last anticoagulant _____

Airway (circle) EZ / Difficult Fiberoptic Cmac Airtraq LMA Tube sz. _____

Drugs

Preop- Famotidine _____ Midazolam _____ Celecoxib _____ Tramadol _____ Pregablin _____

Antibiotic- Cefazolin _____ Ampicillin/ Sulbactam _____ Ertapenem _____ Other _____ -- Last/Next dose _____

Analgesic- Fentanyl _____ Hydromorphone _____ Sufentanil _____ Acetaminophen _____ Last dose _____

Muscle relaxant- Rocuronium _____ Cisatricurium _____ Last dose/TOF Reversal _____

Antiemetic- Aprepitant _____ Scopolamine _____ Decadron _____ Ondansetron _____ Promethazine _____

Blocks

Epidural _____ Infusion start time _____ Tap Block _____ Scalp block _____ Other _____

I&O

Crystalloid _____ Colloid _____

PRBC's _____ FFP _____ Platelets _____

U.O _____ EBL _____