Implementation of a Standardized Pre-procedure Handoff Bundle

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Abstract

Problem & Purpose: Within the Interventional Radiology (IR) department at a large, academic medical center, instances of patient harm and sentinel events have occurred due to improper patient, procedure, or site verification. Literature review reveals the use of a pre-procedure safety checklist may contribute to the prevention of wrong-patient, wrong-procedure, or wrong-site events, and supports the use of the Situation, Background, Assessment, Recommendation (SBAR) model for pre-procedure handoff to improve communication among staff. The aim of this quality improvement (QI) initiative was to implement a pre-procedure handoff bundle to prevent wrong-patient, wrong-procedure, or wrong-site events. **Methods**: The pre-procedure handoff bundle, including completion of the Procedure Pass checklist and the performance of bedside handoff using SBAR, was implemented over 15 weeks within the IR department. All inpatients and outpatients undergoing vascular or neurovascular intervention who were prepped for a procedure within the prep and recovery area were included for intervention. Weekly chart audits and review of morbidity and mortality reports were performed using the electronic health record to determine whether project outcomes were met. **Results**: 100% of eligible patients (952/952) were included in data collection, with no occurrences of wrong-patient, wrong-procedure, or wrong-site events. Average Procedure Pass compliance was 31% (295/952), while average pre-procedure handoff compliance was 20% (190/952). **Conclusions**: Findings suggest that the implementation of a pre-procedure handoff bundle within the IR department was successful at preventing wrong-patient, wrong-procedure, or wrong-site events. The inclusion of a pre-procedure handoff bundle was both feasible and necessary to improve patient safety and staff communication within the IR department.

Keywords: handoff, communication, wrong-procedure, wrong-patient, wrong-site events

Implementation of a Standardized Pre-procedure Handoff Bundle

Within a procedural area, such as Interventional Radiology (IR), a pre-procedure handoff is to be performed to ensure that the correct patient is to undergo the correct procedure. The minimum content to be discussed prior to procedure initiation includes verification of the correct patient, the correct procedure, and the correct site, as outlined in the Universal Protocol that was mandated for accreditation by the Joint Commission in 2004 (Cabral et al., 2016). Despite the Universal Protocol, wrong-patient, wrong-procedure, and wrong-site events occur approximately 50 times each week within the United States (Cabral et al., 2016). Within the IR department at a large academic medical center, instances of patient harm and sentinel events have occurred due to improper patient, procedure, or site verification. In 2014, a patient scheduled to have a paracentesis underwent a lumbar puncture with intrathecal chemotherapy administration due to the procedure team not checking the identification of the patient. In 2019, a patient scheduled to undergo a left upper extremity and right lower extremity angiogram for pre-operative tumor embolization underwent a bilateral lower extremity angiogram due to improper site marking and omission of procedure order verification.

Root cause analysis of the problem was performed with key stakeholders in the organization and multiple causes were identified, including technology, variability of content and consistency of nurse handoff, the environment, and the policies and procedures within the department. Of the identified causes, the issue most responsible for the problem included decreased staff communication and inconsistent nurse handoff practices. Analysis of the current handoff process revealed that patients prepped for a procedure were taken into the procedural suite regardless of handoff being performed by the pre-procedure and intra-procedure nurses. In addition, the requirement for the intra-procedure nurse to perform a hard stop, including

verification of the patient, procedure, and procedure site, may or may not be performed prior to bringing a patient to the procedure suite, ultimately leading to an increased risk of wrong-person, wrong-procedure, or wrong-site events. See Figure 1 for a workflow map of the current process.

According to the Agency for Healthcare Research and Quality (AHRQ), communication issues among team members has been noted as a prominent underlying factor in wrong-patient, wrong-procedure, and wrong-site events (AHRQ, 2019). As a result, the prevention of wrong-patient, wrong-procedure, and wrong-site events has become one of the Joint Commission's National Patient Safety Goals (The Joint Commission, 2022). Preventing patient harm is of utmost importance, therefore the aim of this QI project included the use of a standardized pre-procedure handoff bundle to increase communication amongst staff and decrease sentinel events, including wrong-person, wrong-procedure, or wrong-site events.

Available Knowledge

To evaluate the evidence surrounding the use of a pre-procedure handoff bundle, a literature review was performed using the Scopus database. The terms "checklist" OR "surgical safety checklist" AND "patient outcomes" AND "SBAR" AND "communication" were used with English language and 10-year search limiters. Utilizing the criteria established by the Johns Hopkins Nursing Evidence Based Practice (JHNEBP) model, multiple levels and quality rankings were included in the synthesis (Dang, 2022). Four level one sources with an overall quality rating of "A" were reviewed, including two systematic reviews of randomized controlled trials (RCTs) and two RCTs (Biccard et al., 2016; Boyd et al., 2017; Chaudhary et al., 2015; Haugen et al., 2015). All studies evaluated the impact of a safety checklist within various settings and with multiple outcomes assessed including morbidity and mortality, postoperative complications, and hospital length of stay. Collectively, all studies noted a significant decrease in

complication rates when a checklist was utilized compared to standard care, or no checklist. Biccard et al. (2016), Boyd et al. (2017), and Chaudhary et al. (2015) reported a statistically significant reduction in mortality rates, whereas Haugen et al. (2015) did not find decreased mortality rates when a checklist was used.

Two level three sources with an overall quality rating of "B" were reviewed, including two systematic reviews of RCTs, quasi-experimental, and non-experimental studies (Bergs et al, 2014; Müller et al., 2018). Bergs et al. (2014) noted a decrease in complication rates, mortality rates, and surgical site infections when the World Health Organization's (WHO) surgical safety checklist (SSC) was utilized compared to no checklist. Müller et al. (2018) noted a decrease in communication errors, 30-day readmission rates, and unexpected death rates when varying situation, background, assessment, and recommendation (SBAR) interventions were utilized during handoff. See Table 1 for the evidence review tables and Table 2 for the evidence synthesis table.

Rationale

To successfully implement the proposed practice change, the Knowledge-to-Action (KTA) framework was utilized. The KTA framework consists of two main cycles, the knowledge creation cycle and the action cycle, which allow for advancement from the process of knowledge generation to the dissemination and sustainment of knowledge (Graham et al., 2006). Within the action cycle, there are seven steps that promote a proposed practice change including 1) problem identification, 2) adaptation of knowledge to the local context, 3) assess barriers to the use of knowledge within the local context, 4) selection and implementation of interventions 5) monitor the use of new knowledge, 6) evaluate the outcomes, and 7) sustaining the use of new knowledge. Within the IR department, use of the KTA framework revealed patient harm and

sentinel events as the major problem, warranting practice change and the need for improvement. Next, adaptation of broad knowledge gained from the evidence review to the local IR department and assessment of potential barriers to the use of newly gained knowledge and practice change took place. After, the selection, tailoring, and implementation of a customized IR handoff bundle was implemented, and monitoring of the practice change to evaluate structure, process, and outcome measures was performed. Consequently, the sustainment of the IR handoff bundle was both recommended and warranted after project completion. See Figure 2 for the KTA framework model.

Methods

A pre-procedure handoff bundle was implemented in the IR department at a large academic medical center over a 15-week period from August 2022 through December 2022. Within the IR department, both vascular and neurovascular interventions are performed for inpatients and outpatients, with an average of 300 procedures performed each month. Project participants included patients and IR staff members, notably registered nurses, who completed the handoff bundle. To ensure all eligible participants were included for data collection, the use of timestamps within the electronic health record (EHR) were analyzed, and therefore every patient prepped for a procedure in the IR department was included for data collection. Exclusion criteria included pediatric patients or patients coming from the intensive care unit (ICU) who were not prepped for a procedure in the IR department and went directly into the procedural suite.

The pre-procedure handoff bundle included the use of a pre-procedure checklist and the performance of bedside handoff prior to a patient entering the procedural suite. The pre-procedure checklist was accessed using the Procedure Pass flowsheet, which was a readily

available, but underutilized tool within the EHR, Epic Radiant. The checklist allowed the pre-procedure nurse to document task completion in real-time, including patient, procedure order, and consent verification, among other tasks. Face validity of the checklist was based on consensus with organization stakeholders. See Appendix A for the Procedure Pass checklist flowsheet.

Once a patient was prepped for the procedure, the pre-procedure and intra-procedure nurses completed bedside handoff utilizing the SBAR model. Use of the SBAR model allowed for the discussion of standardized information during handoff, including patient verification, the procedure to be performed, site laterality if applicable, procedure order and consent verification, moderate sedation/general anesthesia consent verification, code status verification, allergies, and prophylactic antibiotic or medication administration. After performance of bedside handoff, documentation of handoff was entered into the "RN/Tech Handoff" flowsheet found within the EHR, prior to the patient entering the procedure suite. See Appendix B for the RN/Tech Handoff flowsheet.

To assess the impact of the intervention, data was collected weekly, exclusively by the Doctor of Nursing Practice (DNP) student project lead, and included all adult inpatients and outpatients undergoing vascular or neurovascular intervention who were prepped for a procedure in the IR department. See Appendix C for the data collection tool. Success of project implementation was measured using the structure, process, and outcome goals. The structure goal for the project included education of IR staff members about the purpose of the DNP project, as well as the expectations of the practice change, which was measured using an attendance sign-in sheet. The process goals included Procedure Pass compliance and bedside handoff compliance, and were measured weekly using EHR chart audits. The outcome goal for

the project included the prevention of wrong-patient, wrong-procedure, and wrong-site events. Analysis of the outcome goal was measured weekly using safety event reports and morbidity and mortality (M&M) reports.

Prior to project implementation, a cultural analysis was performed and revealed multiple barriers, including a hierarchical culture and the potential for senior clinical leaders to create an environment that was not open to idea sharing. To address these barriers, the creation of an implementation team was performed, and consisted of champions from multiple disciplines to ensure staff buy-in, including a clinical site representative (CSR), project sponsor, and faculty advisor. Strategies and tactics used during project implementation included use of incentives to gain buy-in from staff, recruitment of unit-champions to reinforce the practice change, and visual cues placed on computers to provide reminders about the use of Procedure Pass and performing bedside handoff. Bi-weekly emails were sent to staff members with progress reports providing updates on compliance rates and visual run charts to promote further adherence.

Ethical Considerations

To ensure the implementation and analysis of the pre-procedure handoff bundle was performed in an ethically sound manner, patient data was stored and analyzed using a password-protected computer in a private room, using REDCap, a HIPAA-compliant data collection tool. To protect patient confidentiality, data was accessed solely by the Doctor of Nursing Practice (DNP) student project lead, and non-identifying record numbers were assigned to each patient. In addition, non-human subject's research determination from the Human Research Protections Office (HRPO) of the University of Maryland School of Medicine (UMSOM) Institutional Review Board (IRB) was obtained prior to project implementation. No conflicts of interest were noted throughout project implementation.

Results

A total of 952 patients were included in data collection during the 15-week implementation period. The structure goal was met by providing education to 100% (37/37) of IR staff members, including 11 physicians, 14 staff nurses, 11 travel nurses, and two chief radiology technologists. A sign-in sheet with staff members who received education was collected and updated daily, until 100% of staff members were educated.

The first process goal was 80% of IR nurses would use the Procedure Pass checklist prior to a patient entering the procedure suite. Compliance with the Procedure Pass checklist ranged from 0% (0/50) during week 2 to 56% (32/57) during week 12, with the average compliance rate reaching 31% (295/952). A gradual increase in compliance occurred from week 2 to week 12, with a positive shift noted in the data from week 8 to week 14. This increase was likely the result of additional staff education and the provision of incentives to staff members who were noted to be compliant with the pre-procedure handoff bundle. No significant runs, trends, or astronomical data points were noted. See Figure 3 for the run chart outlining Procedure Pass compliance.

The second process goal was 80% of IR nurses would perform and document bedside handoff using the SBAR model prior to a patient entering the procedure suite. Compliance with bedside handoff ranged from 1% (1/73) during week 5 to 30% (17/57) during week 12. The average compliance rate was 20% (190/952). An increase in compliance was noted with performance of bedside handoff, though the compliance rate was less than use of Procedure Pass overall. A shift in the compliance was noted from week 1 to week 6. No significant runs, trends, or astronomical data points were noted. See Figure 4 for the run chart outlining pre-procedure handoff compliance.

The outcome goal for the project included 100% of adult patients undergoing procedural intervention would be free from wrong-patient, wrong-procedure, or wrong-site events. The outcome goal was successfully met with no instances of patient harm or sentinel events. Education associated with the quality improvement project was delivered at the initiation of the intervention, as well as throughout the 15-week implementation period, providing constant reminders for staff members to perform the pre-procedure handoff bundle. Attention to the quality improvement project from staff members may have contributed to heightened attention to patient safety, thereby contributing to the prevention of patient harm and sentinel events. See Figure 5 for the run chart outlining the number of wrong-patient, wrong-procedure, or wrong-site events.

Throughout data collection, the DNP Project Student Lead was able to analyze for any trends in the data. It was noted that compliance for the pre-procedure handoff bundle was low overall, and therefore it was necessary to re-evaluate strategies and tactics that were utilized. During week 6, the DNP Project Student Lead provided additional education sessions to IR staff members, as well as offered incentives to staff members who were noted to be more compliant than others to promote project success. After the promotion of incentives and re-education of staff members, an increase in both Procedure Pass and pre-procedure handoff compliance was noted.

Barriers to project implementation included inconsistent staffing, with approximately 50% of IR nurses being travel nurses, as well as the lack of a nurse manager during project implementation to assist in promoting the practice change. These limitations may have contributed to the overall low compliance rate. These barriers were overcome by project facilitators, including the use of unit-based champions in the absence of a nurse manager,

incentives to promote staff buy-in, and consistent education and communication with staff. By educating staff members about the purpose of the quality improvement project, including increasing patient safety and improving communication among staff, raised awareness and recognition of the importance of the pre-procedure handoff bundle was an unexpected benefit that resulted from project implementation. Given the utilization of resources that were already present within the EHR, no additional costs were incurred during project implementation.

Discussion

Prior to implementation of the pre-procedure handoff bundle, the lack of a standardized pre-procedure handoff practice led to the potential for increased risk of patient harm and sentinel events. Evidence-based literature supports the use of a pre-procedure checklist, as well as the performance of bedside handoff using the SBAR model, to improve patient outcomes. While the process goals of 80% compliance with the use of the pre-procedure handoff bundle was not achieved, the outcome goal was successfully met, thereby displaying consistent results compared to the literature, including Biccard et al. (2016) and Müller et al. (2018). Long-term use of the pre-procedure handoff bundle within the local context is both warranted and feasible, with no additional cost to the department and minimal additional time needed to complete the bundle.

Intentional and situational context factors, such as intervention implementation, time, and inconsistent staffing due to the COVID-19 pandemic, were possible contributions to special-cause variability within the data. Additional factors that may have accounted for the prevention of wrong-patient, wrong-procedure, and wrong-site events includes the performance of the pre-procedure time out, which is performed intra-procedure prior to initiation of the procedure. In addition to the pre-procedure time out, the purpose of the pre-procedure handoff bundle includes determining potential mistakes prior to a patient entering the procedure suite, adding an

additional safety check to the process. Recognition of these factors, and the possibility of variation within the data as a result, was recognized.

Project limitations include the lack of generalizability to procedural areas that do not utilize Epic Radiant, and therefore do not access to the Procedure Pass checklist. Replication of a pre-procedure safety checklist with similar content could be utilized if Procedure Pass is not readily available. Initial hesitation with the pre-procedure handoff bundle included concern from staff members about additional data audits and consequences of non-compliance. These concerns were addressed, and staff members were made aware that there would be no consequences associated with non-compliance during the initial implementation phase, but instead rewards would be provided for staff members noted to be compliant and participating in the provision of safe patient care.

Conclusions

The outcomes of this project suggest that the implementation of a pre-procedure handoff bundle within the IR department was successful in preventing wrong-patient, wrong-procedure, or wrong-site events, as well as increasing staff communication. This quality improvement project demonstrated the inclusion of the pre-procedure handoff bundle was feasible within the current context and necessary to improve patient safety within the IR department. The results of this project are significant because an increase in patient safety is of utmost importance and may ultimately lead to significant cost savings for the organization. The pre-procedure handoff bundle is generalizable to other procedural settings within the organization, including the operating room (OR) and cardiac catheterization lab. Future initiative recommendations include partnership with other procedural settings to standardize the pre-procedure handoff bundle institution wide, and ultimately within the entire 12 hospital system network. Further

improvements in patient safety and cost savings may be noted with the use of the pre-procedure handoff bundle throughout all procedural areas within the institution.

Sustainability of the practice change is recommended to continue to improve patient outcomes. With continued education and communication with staff, an increase in staff compliance can result in sustained practice change. Implications for future practice includes incorporation of the pre-procedure handoff bundle into new nurse orientation to ensure that the use of the handoff bundle is considered the standard practice moving forward. With the pre-procedure handoff bundle becoming the expected standardized practice change, an improvement in patient and staff satisfaction may also be noted. Incorporation of the pre-procedure handoff bundle is both feasible and recommended in any procedural setting where improving patient safety and preventing sentinel events is a priority.

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Tables

Table 1.

Evidence Review Table

Citation: Biccard, B. M., Rodseth, R., Cronje, L., Agaba, P., Chikumba, E., Du Toit, L., Farina, Z., Fischer, S., Gopalan, P. D., Govender, K., Kanjee, J., Kingwill, A., Madzimbamuto, F., Mashava, D., Mrara, B., Mudely, M., Ninise, E., Swanevelder, J., & Wabule, A. (2016). A meta-analysis of the efficacy of preoperative surgical safety checklists to improve perioperative outcomes. *South African Medical Journal*, *106*(6), 592. https://doi.org/10.7196/samj.2016.v106i6.9863					**Level and Quality** **I – A**
Purpose/ Hypothesis	**Design**	**Sample**	**Intervention**	**Outcome(s)**	**Results**
The aim of this systematic review (SR) was "to determine the efficacy of the surgical safety checklist (SCC) in randomized controlled trials (RCTs)".	SR of RCTs with meta-analysis	**Search Strategy:** A search was conducted using the OvidSP search engine and reviewed five databases using the keywords "surgery" and "surgical procedure operative" and "operating rooms" and "perioperative care" and "checklist adherence". 638 studies were identified and then screened based on inclusion and exclusion criteria. Two separate individuals reviewed studies for relevance and quality. The indications for inclusion and exclusion criteria of studies were noted. **Eligible Studies:** 464 randomized controlled trials comparing standard operating room management and a SSC for patients undergoing a surgical procedure. A comprehensive search, including studies written in any language between the years 1946 – 2015 were included for eligibility. **Excluded:** 459 studies were excluded – (263) were not for surgical patients, (151) did not utilize a surgical checklist, (31) did not utilize an operative checklist, (11) were not randomized, (2) were withdrawn trials, and (1) was an active trial still trying to recruit participants. **Included:** 3 studies with 6,060 total participants. All studies focused on efficacy of SSCs in relation to patient mortality, complication rate, length of stay, and/or cost.	**Control:** The meta-analysis included multiple controls including either no checklist or an existing preoperative checklist that did not contain all items of the World Health Organization (WHO) SSC. **Intervention:** The meta-analysis included multiple interventions including a surgeon-specific procedural checklist, the World Health Organization's (WHO) SSC, and a modified version of the WHO's SSC.	**DV:** The primary outcome was mortality. The secondary outcomes included surgical complications, anesthetic complications, length of stay, and cost. **Measure:** Mortality = death occurring in the hospital or within 30 days postoperatively. Surgical complications = hospital readmission; respiratory, cardiac, infection, surgical wound rupture, nervous system, bleeding, embolism, mechanical implant complication, anesthetic complication, renal, or abdominal complications; or	**Level of Measurement**: A meta-analysis of studies was performed using a random-effects model. If heterogeneity was detected, a I^2 or X^2 was used to reassess the significance of treatment effect. **Outcome Data Retrieval**: Data from all selected articles was utilized. **Analysis**: Studies discussing mortality showed an overall decrease in mortality rate when a SSC was utilized compared to standard surgical care (Risk Reduction [RR] 0.59, 95% CI 0.42 – 0.85, p = 0.004). Studies discussing surgical complications revealed a decreased complication rate when a SSC was utilized compared to standard surgical care (Odds Ratio [OR] 0.64, 95% CI 0.57 – 0.71, p < 0.00001). For other secondary outcomes, such as specific complications by system (i.e. respiratory), length of stay, and cost were discussed in one trial, but not in others, and therefore a meta-analysis was unable to be calculated. **Conclusions**: The use of a SSC was associated with significant decreased in both

		PRISMA: Included the decision-making criteria for omitting or retaining studies for the meta-analysis. **Power Analysis:** Not applicable to the meta-analysis critique.	**Protocol:** Not applicable to the meta-analysis critique.	unplanned return to the operating room.	short-term mortality rates and surgical complication rates. **SR Bias Risk**: Bias risk is moderate based on the described methodology. A funnel plot was provided within the study.

Citation: Haugen, A. S., Søfteland, E., Almeland, S. K., Sevdalis, N., Vonen, B., Eide, G. E., Nortvedt, M. W., & Harthug, S. (2015). Effect of the World Health Organization checklist on patient outcomes: A stepped wedge cluster randomized controlled trial. *Annals of Surgery, 261(*5), 821 - 828. https://doi.org/10.1097/sla.0000000000000716					**Level and Quality** **I – A**
Purpose/ Hypothesis	**Design**	**Sample**	**Intervention**	**Outcome(s)**	**Results**
The aim of this study was to "evaluate the impact of the World Health Organization's (WHO) Surgical Safety Checklist (SSC) on morbidity, mortality, and length of hospital stay".	Blind, randomized controlled trial (RCT)	**Sampling Technique:** Stepped-wedge group design. **Eligible Participants**: 5,460 participants of all ages undergoing elective or emergent surgery from various specialties, such as neurology, urology, cardiothoracic, orthopedic, and general surgery. **Excluded**: Patients not involving all three parts of the checklist (i.e. gamma knife treatment or donor surgery) were excluded. **Accepted**: 5,295 participates undergoing elective or emergent surgery. 140 participants did not meet inclusion criteria (140 received gamma knife treatment and 4 underwent donor surgery) and 121 did not have complete date of birth information completed, and therefore did not meet inclusion criteria. **Control**: 2,212 adult patients. 2,212 participants were analyzed. **Intervention**: 3,083 adult patients. 2,263 patients were analyzed (613 participants had partial intervention compliance and 207 participants did not comply to the intervention). **Power analysis**: 1,110 participants needed in each group to meet 91% power analysis. Power analysis met, reducing the risk of committing a Type II error.	**Control Protocol**: Normal pre-procedure care was provided; no checklist was utilized. **Intervention Protocol**: Utilization and completion of the WHO SSC prior to surgical intervention. **Treatment fidelity**: Data for the SCC was collected by traditional documenting methods through online registration practices by operating room nurses, nurse anesthetists, anesthesiologists, and surgeons. An educational program	**DV**: Major and minor complications and in-hospital mortality. Hospital length of stay was a secondary endpoint. **Measure**: Major and minor complications were defined as occurrence of respiratory complications (Pneumonia, respiratory failure, other), cardiac complications (cardiac arrest, arrythmias, congestive heart failure, acute myocardial infarction, angina pectoris), infections (sepsis, surgical site, urinary tract, other), surgical wound rupture, nervous system complication, bleeding, and embolism, among others. In-hospital mortality was defined as death occurring during hospital admission. **Time**: Data was collected for 11 months from August 2009 – June 2010.	**Statistical Results**: There was a statistically significant reduction in overall (major and minor) complication rate between the intervention group 11.5% and the control group 19.9% ($p < 0.001$). There was no statistically significant decrease in in-hospital mortality rates between the intervention group 1.0% and the control group 1.6% ($p = 0.151$). Nominal data was analyzed using the Pearson exact X^2 test. Continuous variables were analyzed using an independent *t* test. **Clinical Significance/Conclusion**: Given adequate study power and homogeneity between groups, the use of the WHO's SSC may lead to decreased complication rates and reduce in-hospital length of stay.

		Group Homogeneity: Control and intervention groups appear homogenous. Characteristics including age, gender, comorbidities, surgical procedure, and type of anesthesia administered were comparable at baseline. Reported p-values for all characteristics were non-significant.	with standardized information materials and lectures were provided to all staff.	**Procedure:** Data on the outcome measures were collected by research assistants based on administrative data.	Additional studies with improved treatment fidelity may be needed in order to lead to practice change.

Citation: Boyd, J., Wu, G., & Stelfox, H. (2017). The impact of checklists on inpatient safety outcomes: A systematic review of randomized controlled trials. *Journal of Hospital Medicine*, *12*(8), 675–682. https://doi.org/10.12788/jhm.2788					**Level and Quality** **I – B**
Purpose/ Hypothesis	**Design**	**Sample**	**Intervention**	**Outcome(s)**	**Results**
The aim of this systematic review was "to determine whether checklists, as a type of a decision-support tool, are effective at improving patient safety outcomes in hospitalized patients".	Systematic review (SR) of randomized controlled trials (RCTs)	**Search Strategy:** A search strategy was conducted using the Ovid EMBASE, Ovid MEDLINE, PubMed, and Cochrane Central Register of Controlled Trials using the keywords "checklists" and "patient outcomes assessment". 11,225 studies were identified and then screened based on inclusion and exclusion criteria. Two individuals reviewed studies for relevance and quality. Indications for inclusion and exclusion criteria of the studies were noted. **Eligible Studies:** 83 RCTs comparing the use of a checklist to no checklist for in-patients. A comprehensive search, including studies written in any language with no publication date restrictions were included for eligibility. **Excluded:** Studies were excluded if the study design was not an RCT (39%) or if there was no checklist intervention (34%). **Included:** 9 studies with a total of 16, 987 participants. All studies focused on use of a checklist tool in relation to various patient outcomes, 30-day	**Control:** The SR included studies with a control group consisting of no checklist or standard care/handover. **Intervention:** The SR included studies with various versions of a checklist as the intervention. **Protocol:** Not applicable to the SR critique.	**DV:** The primary outcomes included patient outcomes (i.e. requiring intervention, life-threatening), in-hospital mortality, 30 day mortality rate, 30 day readmission rate, and length of hospital stay. **Measure:** Complications = varying complications as defined by the World Health Organization's (WHO) International Classification of Disease (ICD – 10) and Clavien-Dindo classification. In-hospital mortality = death occurring while the participant was admitted to the hospital. 30-day mortality rate = death of participant within 30 days of intervention implementation. 30-day readmission rate = rate of participants requiring readmission to the hospital within 30 days of intervention. Length of hospital stay = average length of hospital stay	**Level of Measurement:** A systematic review of studies was performed using a random-effects model. Authors noted heterogeneity between checklists utilized in study interventions, leading to the inability to perform a robust meta-analysis. **Outcome Data Retrieval:** Data from all selected articles was utilized. **Analysis:** Studies discussing 30-day mortality showed a significant reduction when a checklist was utilized compared to no checklist (Odds Ratio [OR] 0.60, 95% CI 0.41 – 0.89, p = 0.01). Studies analyzing use of a surgical safety checklist (SSC) compared to no checklist noted a decreased incidence of postoperative complications (Relative Risk [RR] 0.63, 95% CI, 0.58 – 0.72, p < 0.001). Other outcomes, such as specific complications (i.e. pain), length of stay, and checklist compliance, were discussed in some studies and not others, and therefore a meta-analysis was unable to be calculated. **Conclusions:** The use of a checklist was associated with a decrease in 30-day mortality rate, as well as postoperative

		mortality, length of stay, and compliance with checklist. **PRISMA:** Included in the decision-making criteria for omitting or retaining studies for the systematic review. **Power Analysis:** Not applicable to the SR critique.		for participants undergoing intervention. (Note: not all of the measurement information was clear within the article).	complications, when compared to use of no checklist. **SR Bias Risk:** Bias risk is moderate based on inability to perform meta-analysis due to heterogeneity of checklists and outcomes measured.

Citation: Chaudhary, N., Varma, V., Kapoor, S., Mehta, N., Kumaran, V., & Nundy, S. (2015). Implementation of a surgical safety checklist and postoperative outcomes: A prospective randomized controlled study. *Journal of Gastrointestinal Surgery*, *19*(5), 935–942. https://doi.org/10.1007/s11605-015-2772-9					**Level and Quality** **I – C**
Purpose/ Hypothesis	**Design**	**Sample**	**Intervention**	**Outcome(s)**	**Results**
The aim of this study was to "evaluate the effects of using the checklist on the postoperative morbidity and mortality in patients undergoing gastrointestinal surgery and study the compliance of checklist implementation and its effect on patient outcomes".	Prospective, randomized controlled trial (RCT). Primary investigators were not blinded.	**Sampling Technique**: Parallel group study design. **Eligible Participants**: 855 participants undergoing gastrointestinal or hepatobiliary surgical intervention. **Excluded**: Participants less than 16 years of age, receiving liver transplant, or requiring intraoperative assistance were excluded from the study. **Accepted**: 700 adult patients undergoing gastrointestinal or hepatobiliary surgical intervention. **Control**: 350 adult participants. 350/350 participants were analyzed; however, only 298 participants had complete checklists. **Intervention**: 350 adults participants. 350/350 participants were analyzed. **Power analysis**: No power analysis reported, contributing to increased risk of committing a Type II error. **Group Homogeneity**: Control and intervention groups appear	**Control Protocol**: Traditional pre-surgical care provided; no checklist utilized. **Intervention Protocol**: Utilization and completion of a modified World Health Organization (WHO) safety checklist prior to surgical intervention. **Treatment fidelity**: The surgical resident involved in the operation was notified by the principal investigator (PI) whether to fill out the modified WHO checklist before beginning the procedure. The	**DV**: Postoperative complications, mortality, and length of hospital stay. Additional secondary outcomes were also measured (i.e. checklist compliance). **Measure**: Postoperative complications were measured by the occurrence of abdominal, respiratory, bleeding, wound infection, sepsis, cardiovascular, renal, or other complications. Complications were graded utilizing the Clavien-Dindo classification. Mortality was defined as death occurring within 30 days of the operation. Length of stay was defined as the number of days of hospital admission. **Time:** Data was collected for 15 months from February 2012 – April 2013.	**Statistical Results**: There was a statistically significant difference in the number of post-operative wound-related complications between the intervention group 4.5% and control group 8.5% (p=0.04). There was a statistical different in the number of abdominal complications between the intervention group 19.7% and control group 28% (p=0.01). There was also a statistical difference in bleeding complications between the intervention group 0.5% and control group 2.8% (p=0.03). There was no statistical difference between the two groups in terms of respiratory, sepsis, cardiovascular, or renal complications. There was a statistically significant difference in the mortality rate between the intervention group 5.7% and control group 10% (p=0.04). There was no statistically significant difference between the control and intervention groups for hospital length of stay. Nominal data was analyzed using the chi-square or Fisher's exact test. Continuous variables were analyzed using the Mann-Whitney U test. **Clinical Significance/Conclusion**: Given the limited data reported, including no power analysis, findings may be difficult to rely on.

		homogenous. Characteristics including age, gender, and comorbidities were comparable at baseline. Reported p-values for all characteristics were non-significant.	surgical resident was educated on how to fill out the checklist and what information was necessary for completion.	**Procedure:** One surgeon was assigned to the collection of outcome measure data utilizing an electronic database.	Based on this RCT, the use of a modified WHO SSC resulted in a decreased rate of post-operative complications and mortality. No difference was noted in patient length of stay. Authors may need to reproduce this study with additional data reported to portray more reliable findings.

Citation: Bergs, J., Hellings, J., Cleemput, I., Zurel, Ö., De Troyer, V., Van Hiel, M., Demeere, J. L., Claeys, D., & Vandijck, D. (2014). Systematic review and meta-analysis of the effect of the World Health Organization surgical safety checklist on postoperative complications. The British journal of surgery, 101(3), 150–158. https://doi.org/10.1002/bjs.9381					**Level and Quality** **III – B**
Purpose/ Hypothesis	**Design**	**Sample**	**Intervention**	**Outcome(s)**	**Results**
The aim of this review was "to assess the effectiveness of the World Health Organization's (WHO) Surgical Safety Checklist (SSC)".	Systematic review (SR) with meta-analysis	**Search Strategy**: A search strategy was conducted using the Cochrane Library, MEDLINE, Embase and CINAHL databases using the keywords "postoperative complications" and "checklist" and "prevention and control" and "risk management". 723 studies were identified and then screen based on inclusion and exclusion criteria. Two separate individuals reviewed studies for relevance and quality, with disagreements being resolved by a third reviewer. The indications for inclusion and exclusion criteria of studies were noted. **Eligible Studies**: All randomized controlled trials, non-randomized controlled trials, controlled before and after studies, interrupted time series (ITS), and repeated- measures studies. Patients aged 16 or older who were undergoing surgery were included in the SR. Only studies written in the English language were included. **Excluded**: Studies that measured specific complications (i.e. surgical-site marking) were not included. Of the 440 studies that remained after duplicates were removed, 431 additional studies were excluded for reasons not discussed. **Included**: Seven studies were included in the meta-analysis, the total number of participants included was not disclosed. All studies focused on the impact of the	**Control**: The meta-analysis included studies with a control consisting of standard surgical care. **Intervention**: The meta-analysis included studies with the intervention of the WHO's SSC. **Protocol**: Not applicable to the SR critique.	**DV:** The primary outcomes included postoperative complications, surgical-site infections (SSI) and mortality. The secondary outcome was the relationship between clinical outcomes and adherence to completion of the SSC. **Measure:** Mortality = death during the perioperative hospital stay up until 30 days or until hospital discharge. Postoperative complications = any complication resulting from surgical intervention within 30 days of the procedure. Surgical-site infection = presence of infection at	**Level of Measurement**: A meta-analysis of studies was performed using a random-effects model. If heterogeneity was detected, a I^2 or Cochrane Q test was used to reassess the significance of the treatment effect. **Outcome Data Retrieval**: Data from all selected articles was utilized. **Analysis**: Studies discussing postoperative complications revealed a decreased complication rate when the WHO's SSC was utilized (Risk Reduction [RR] 0.59, 95% CI 0.47 – 0.74). Studies discussing mortality revealed a decreased mortality rate when the WHO's SSC was utilized (RR 0.77, 95% CI 0.60 to 0.98). Studies discussing SSI also revealed a decreased rate of SSI when the WHO's SSC was utilized (RR 0.57, 95% CI 0.41 – 0.79). **Conclusions**: The use of the WHO's SSC was associated with a significant decrease

		WHOs SSC on postoperative complications, including mortality. **PRISMA**: Included the decision-making criteria for omitting or retaining studies for the systematic review. **Power analysis**: Not applicable to the SR critique.		the surgical site. (Note: this measurement information was not clear within the article).	in postoperative complications and mortality rate. **SR Bias Risk**: Risk of bias is moderate based on the described methodology, including only using non-randomized controlled trials.
Citation: Müller, M., Jürgens, J., Redaèlli, M., Klingberg, K., Hautz, W. E., & Stock, S. (2018). Impact of the communication and patient hand-off tool SBAR on patient safety: A systematic review. *BMJ Open*, *8*(8). https://doi.org/10.1136/bmjopen-2018-022202					**Level and Quality** **III - B**
Purpose/ Hypothesis	**Design**	**Sample**	**Intervention**	**Outcome(s)**	**Results**
The aim of this systematic review is "to summarize the available evidence for and evaluate the impact of the implementation of Situation, Background, Assessment, and Recommendation (SBAR) in clinical settings on patient safety as measured by the incidence of adverse events"	Systematic review (SR) without meta-analysis	**Search Strategy:** A search strategy was conducted using the PubMed, EMBASE, CINAHL, Cochrane Library, and PsycINFO databases using the keywords "SBAR" or "ISBAR" or "SBAR-R" or "ISBARR" or "ISOBAR". 1,053 studies were identified and then screened based on inclusion and exclusion criteria. Two independent reviewers screened studies for relevance and quality, with disagreements being resolved by consensus or a third reviewer. Indications for inclusion and exclusion criteria were noted. **Eligible Studies:** All original research studies analyzing SBAR as the primary outcome with at least one patient outcome reported. A comprehensive search, including studies written in any language with no publication date restrictions were included for eligibility. No restrictions on time, language, or study type were **Excluded:** Studies were excluded if SBAR was described with no evaluation data on patient outcome(s), use of SBAR was not the main intervention, or survey outcomes or team perceptions were the main reported outcomes. **Included:** 11 studies were included for review, and the total number of participants was not disclosed.	I**ntervention:** Use of SBAR implementation in various forms, settings, and patient populations. Patient handoff, telephone communications, and team communication in general were all included in different studies. Settings included in-patient hospital, nursing homes, and rehabilitation clinics. **Protocol:** Not applicable to the	**DV:** Primary outcomes include 26 varying patient outcomes such as adverse patient events, adverse drug events, sentinel events, falls, communication errors, hospital mortality rates, and 30-day hospital readmission rate, among others. Secondary outcomes included team communication **Measure:** Measurement of individual outcomes was not discussed within the SR.	**Level of Measurement**: A systematic review of studies was performed using a two-way mixed-effects model. Heterogeneity between SBAR interventions, settings, and measures within the studies led to the inability to perform a robust meta-analysis. **Outcome Data Retrieval**: Data from all selected articles was utilized. **Analysis**: Due to the varying outcome measures within the SR, meta-analysis was unable to be calculated. The studies discussing the occurrence of unexpected death noted a statically significant decrease from 0.99 to 0.34 per 1,000 admissions ($p < 0.001$). In addition, a statistically significant decrease in 30-day readmission rates was noted from 0.12 to 0.04 ($p = 0.012$). The number of communication errors decreased from 31% to 11% ($p < 0.0001$). **Conclusions**: The use of SBAR implementation may be effective at decreasing poor patient outcomes. Translating use of SBAR during patient handoff within the interventional radiology

		PRISMA: Included in the decision-making criteria for omitting or retaining studies for the systematic review. **Power Analysis:** Not applicable to the SR critique.	meta-analysis critique.		(IR) suite during the pre-procedure phase of care could also be performed to determine decreased rates of complications and increased rates of patient safety. **SR Bias Risk**: Bias risk is moderate based on the described methodology.

Note. Level and quality ratings based on the Johns Hopkins Nursing Evidence Based Practice (JHNEBP) model criteria (Dang, 2022).

Table 2.

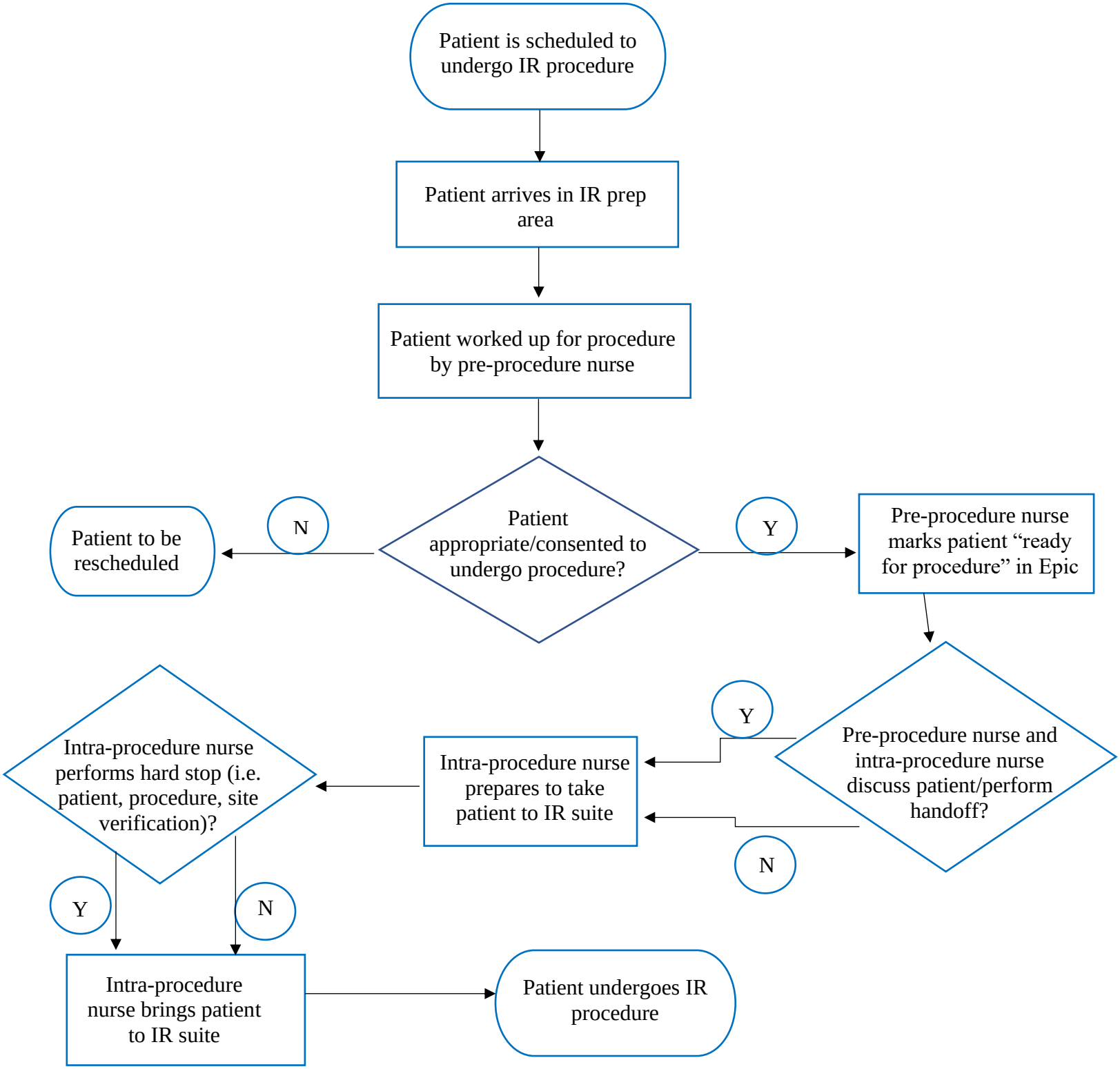
Evidence Synthesis Table

Category (Level Type)	Total Number of Sources/Level	Overall Quality Rating	Synthesis of Findings
Level 1 - Experimental study · Randomized Controlled Trial (RCT) · Systematic review of RCTs with or without meta-analysis	4 Sources: (2) SRs of RCTs (2) RCTs	A	All studies noted a significant decrease in complication rates when a checklist was utilized compared to no checklist. Biccard et al. (2016), Boyd et al. (2017), and Chaudhary et al. (2015) found a statistically significant reduction in mortality rates, whereas Haugen et al. (2015) did not find a reduction in mortality rates when a checklist was used. In addition, Chaudhary et al. (2017) did not find a significant reduction in hospital length of stay when a checklist was used. Biccard et al. (2016) and Boyd et al. (2017) had moderate bias risk.
Level III · Non-experimental study · Systematic review of a combination of RCTs, quasi-experimental, and non-experimental studies, or non-experimental studies only, with or without meta-analysis · Qualitative study or systematic review of qualitative studies with or without meta-synthesis	2 Source: (2) SR including RCTs, quasi-experimental, and non-experimental studies	B	Bergs et al. (2014) noted a decrease in complication rate when the World Health Organization's (WHO) surgical safety checklist (SSC) was utilized. A decrease in mortality rate was also noted when the SSC was used compared to no checklist. Studies analyzing surgical site infections (SSI) also noted a decreased infection rate when the SSC was used. Whereas Müller et al. (2018) noted a decrease in communication errors, 30-day readmission rates, and unexpected death rates when varying SBAR interventions were utilized during handoff. Both Bergs et al. (2014) and Müller et al. (2018) were systematic reviews analyzing an intervention (SSC and SBAR) on patient outcomes. Bergs et al. (2014) and Müller et al. (2018) had moderate bias risk.
Recommendations Based on Evidence Synthesis: There is good and consistent evidence to support the practice change of implementing a pre-procedure handoff bundle to decrease the risk of patient harm and sentinel events, such as wrong-person, wrong-procedure, and wrong-site events.			

Note. Level and quality ratings based on the Johns Hopkins Nursing Evidence Based Practice (JHNEBP) model criteria (Dang, 2022).

Figure 1

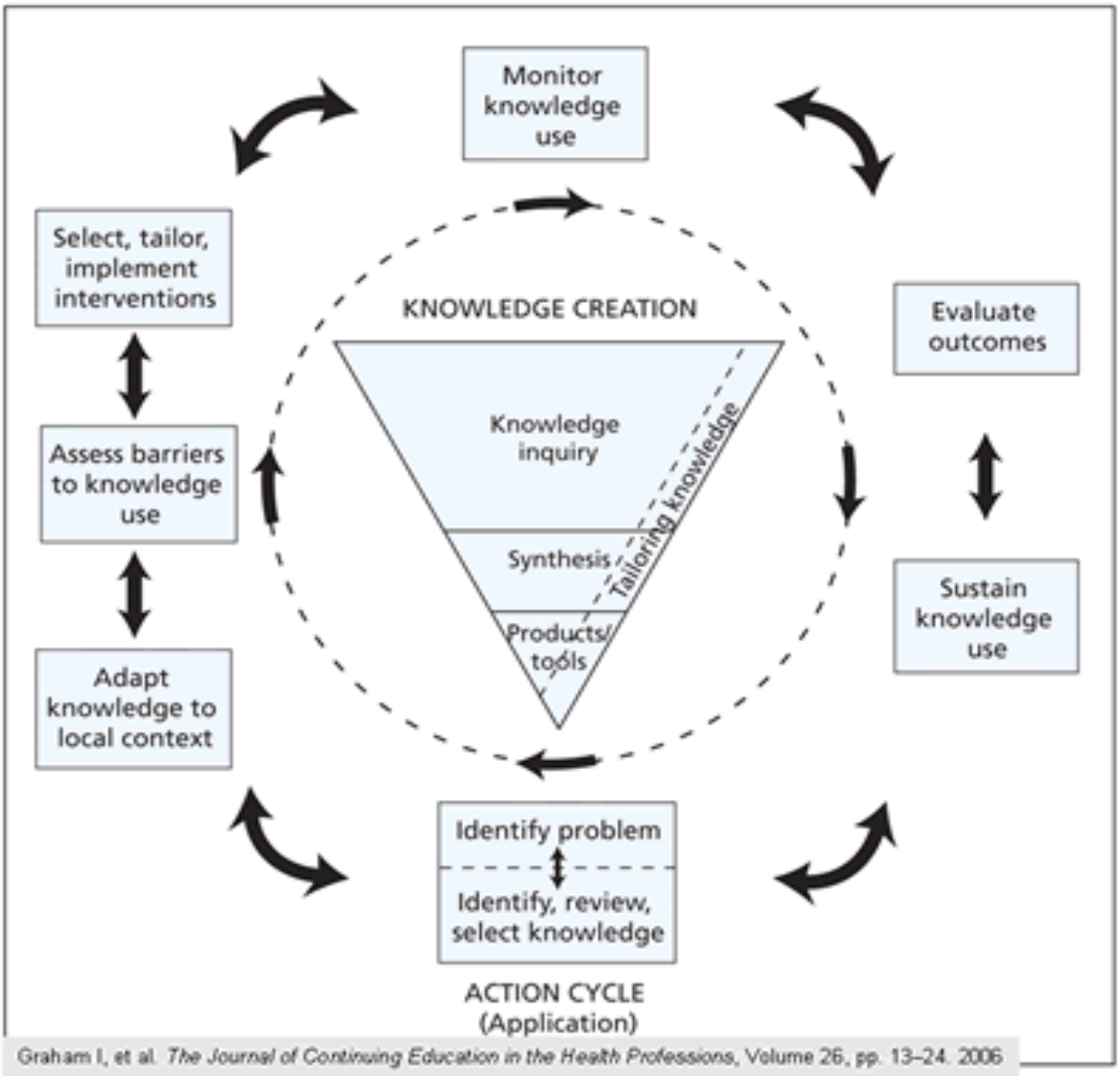
Workflow Map of the Current Handoff Process



Key: Oval = start or end of process, diamond = decision point, rectangle = step in process; IR = Interventional Radiology

Figure 2

The Knowledge-to-Action Framework



Note. Image retrieved from Graham et al. (2006)

Figure 3

Procedure Pass Compliance

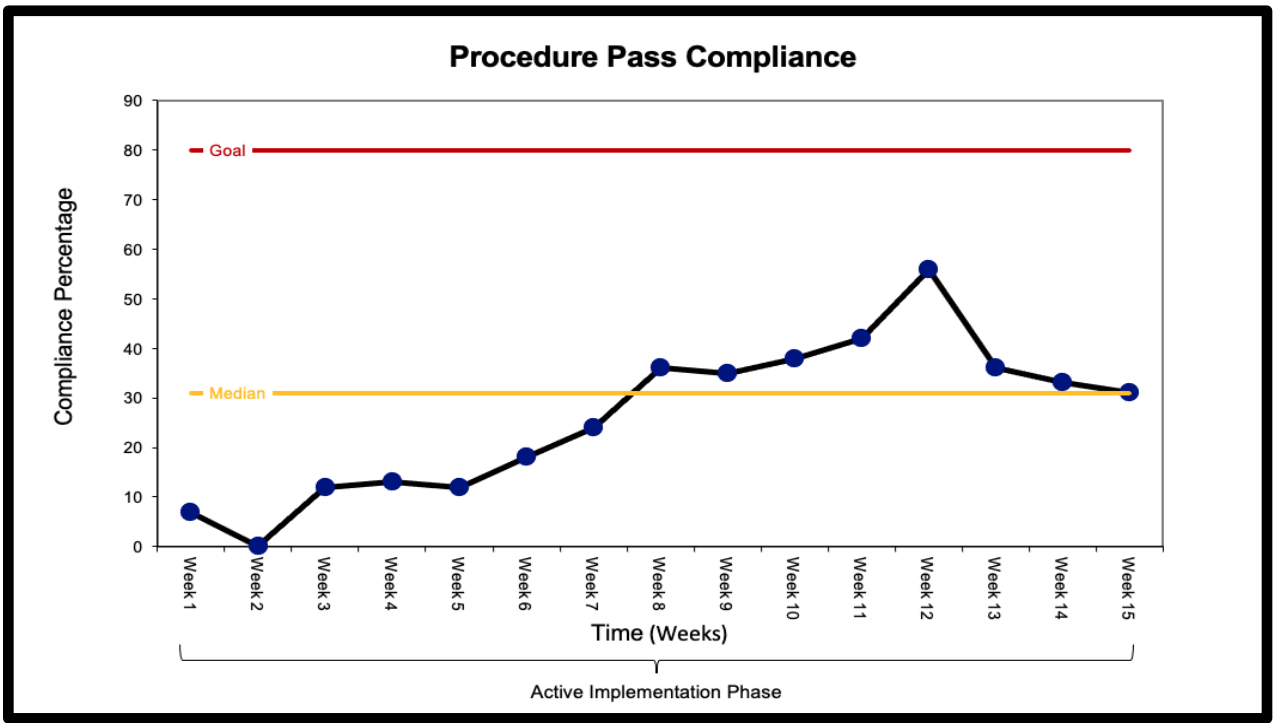


Figure 4

Pre-procedure Handoff Compliance

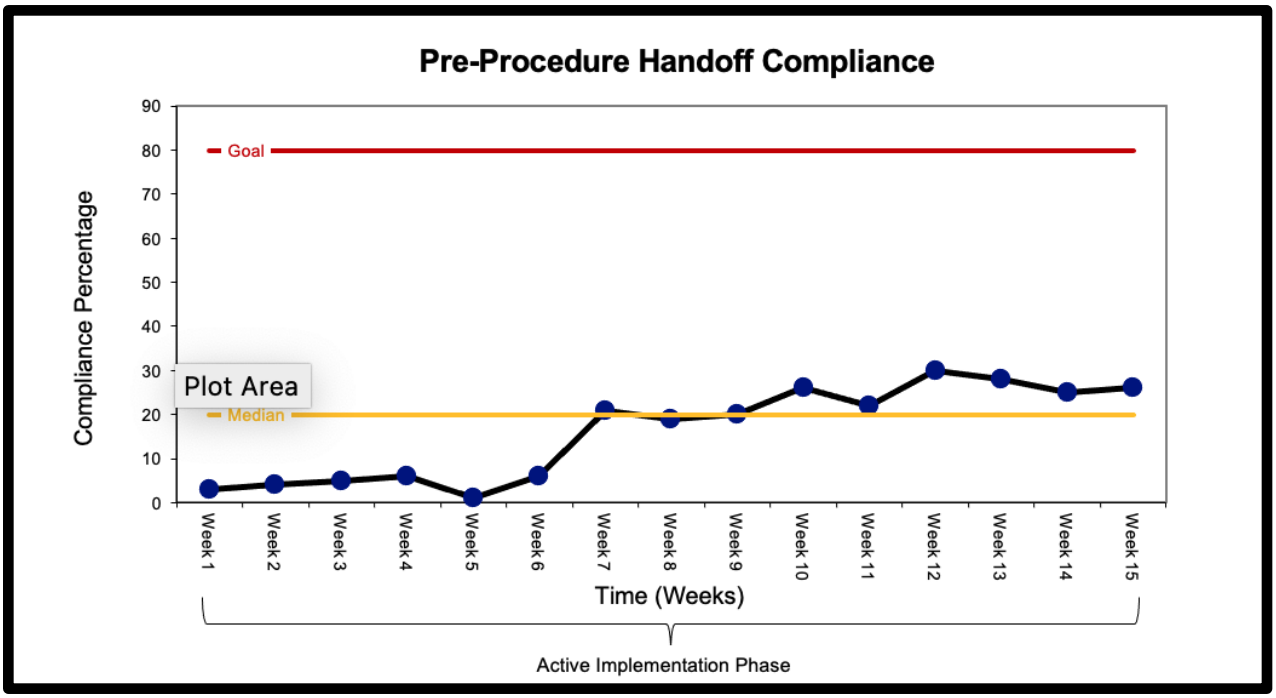
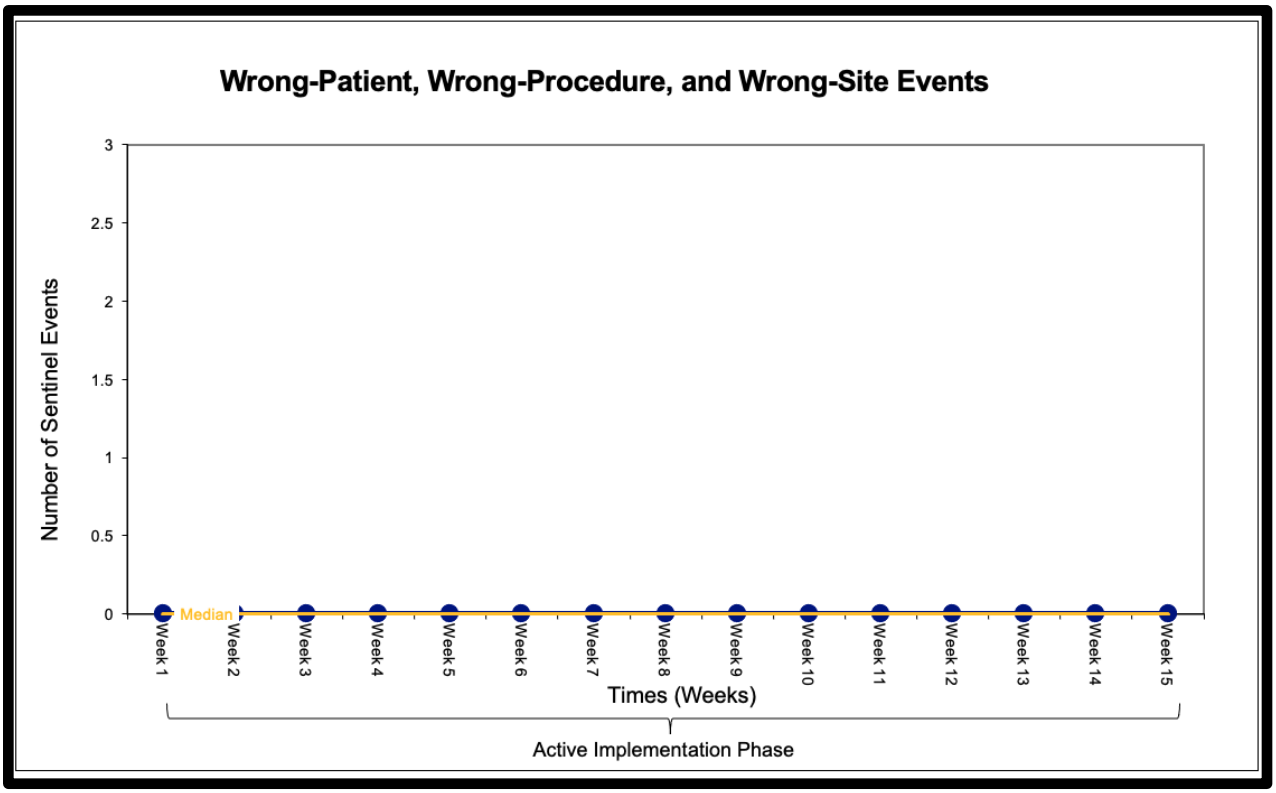


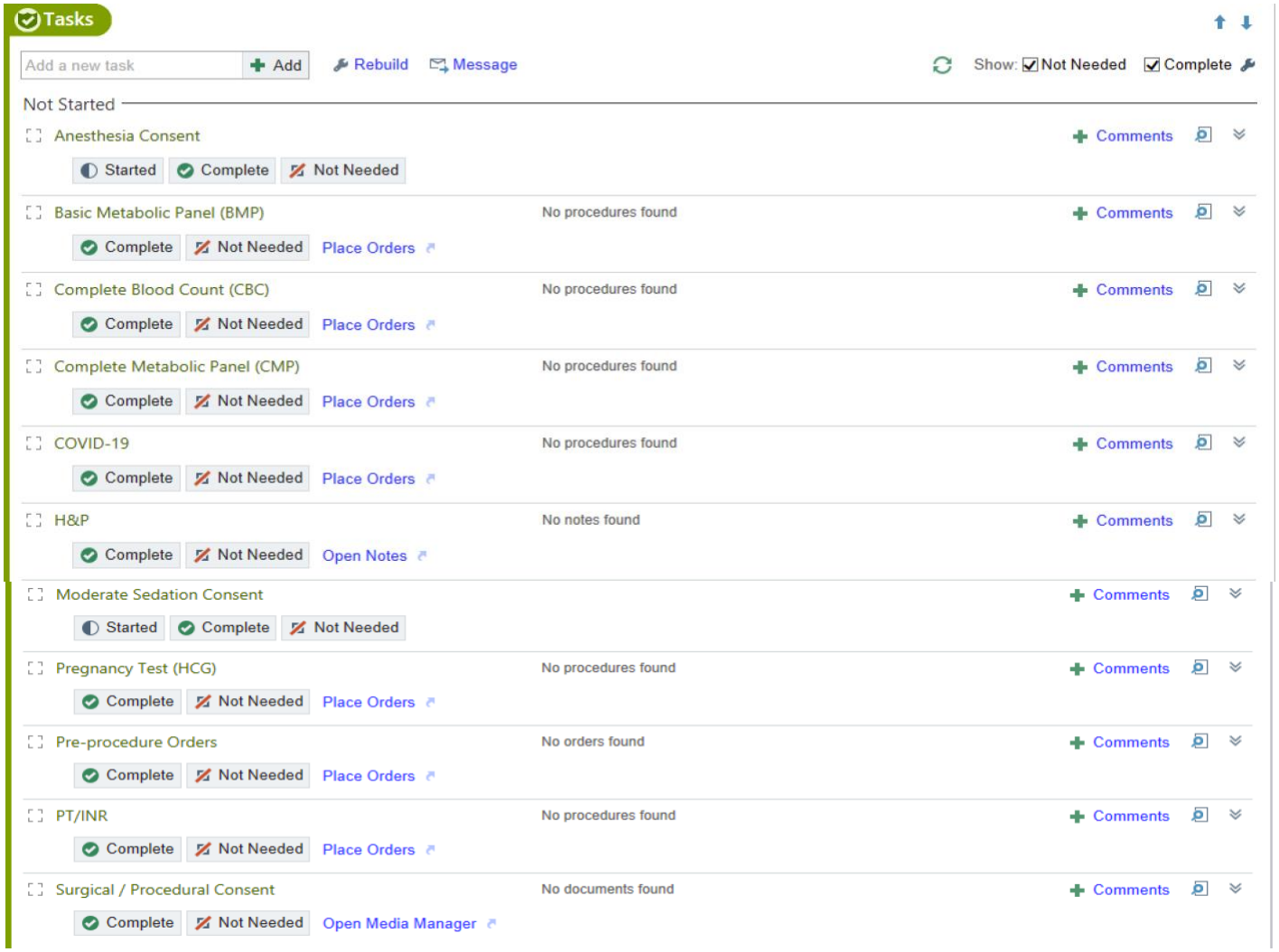
Figure 5

Wrong – Patient, Wrong – Procedure, and Wrong – Site Events



Appendix A

Procedure Pass Flowsheet



Appendix B

RN/Tech Handoff Flowsheet

RN/Tech Handoff	
Timepoint	Periop/Pr...
Sending	
Sending Unit Phone #	
Receiving	
Receiving Unit Phone #	
Handoff Comments	

Appendix C

REDCAP Data Collection Tool

Pre-procedure Handoff Bundle

Record ID	_____
Procedure Date	_____
What time did the patient enter the procedure room?	_____ (Events)
Patient ID Verified?	☐ Verbal ☐ Armband ☐ Patient unable to verbalize ☐ Peds (parent ID) ☐ Emergency ID band (Select all that apply –IR/Cath Checklist)
H & P verified before patient entered the procedure room?	◯ Yes ◯ No ◯ Not documented (Procedure Pass)
Procedure order verified before patient entered the procedure room?	◯ Yes ◯ No ◯ Not documented (Procedure Pass)
Surgical/procedural consent verified before entered the procedure room?	◯ Yes ◯ No ◯ Not documented (Procedure Pass)
Anesthesia consent verified before patient entered the procedure room?	◯ Yes ◯ No ◯ N/A ◯ Not documented (Procedure Pass)
Moderate sedation consent verified before patient entered the procedure room?	◯ Yes ◯ No ◯ N/A ◯ Not documented (Procedure Pass)
Were all aspects of the checklist verified before the patient entered the room?	◯ Yes ◯ No (Questions 4 -8 answered "Yes" or "N/A")
Was handoff documented in the EHR?	◯ Yes ◯ No (RN/Tech Handoff)
Was handoff performed before patient entered room?	◯ Yes ◯ No (RN/Tech Handoff)