

**THE EFFECTS OF IMPLEMENTING TEAMSTEPPS® ON OPERATING ROOM  
STAFF COMMUNICATION**

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### Abstract

Upon root-cause analysis, a lack of communication between nurses and surgeons during the surgical “sign out” was the cause of five specimen handling errors in 2017 at a surgical center in the south central region of the country. This had the effects of longer length of stay, delayed diagnosis, and increased cost. The purpose of this evidence-based process improvement (PI) project was to teach operating room (OR) staff effective communication through Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS®). To meet the objective of this project, the following clinical question was used: In the OR, will implementing TeamSTEPPS® improve communication and decrease specimen handling errors? The goals were to improve the “sign out” process, improve communication between OR staff based on Universal Protocol™ guidelines, and decrease specimen handling errors. The intervention included audits of “sign out” compliance and pathology forms. The TeamSTEPPS® Teamwork Perceptions Questionnaire (T-TPQ), a Likert-type scale, was used to assess staff perceptions of communication before and after implementation. The method utilized was Plan-Do-Check-Act (PDCA). The results of this project demonstrated a decrease in the overall T-TPQ score by one percent, a reduction in specimen errors from a baseline of five to two with a ratio change of 7.35 per 1000 specimens to 3.29, an increase in surgeon compliance to signing pathology forms from 36.25 percent preimplementation to 71.23 percent postimplementation, and no significant difference in compliance to the “sign out.”

*Key words:* adverse events, briefing/debriefing/checklists, burnout, collaboration/interdisciplinary care culture of safety, education, efficiency, incivility, perceptions of teamwork, specimen handling errors, TeamSTEPPS®, Universal Protocol™

### The Effects of Implementing TeamSTEPPS® on Operating Room Staff Communication

Improving communication in the OR can lead to better patient outcomes. Tibbs and Moss (2014) pointed out that Joint Commission (JC) found over two-thirds of surgical adverse events were the result of poor communication and poor teamwork. Anderson et al. (2014) noted that 14.4 percent of surgical patients experienced adverse events, 37.9 percent of which were possibly preventable. TeamSTEPPS® originated in 1973 to improve safety in the air traffic industry and has evolved to include the healthcare industry and was later adopted by The Department of Health and Human Services Agency for Healthcare Quality and Research (AHRQ) to improve patient safety (Plonien & Williams, 2015). “Team Structure, Communication, Leadership, Situational Monitoring, and Mutual Support” are the five key concepts of TeamSTEPPS® (AHRQ, 2013, p. 4). Communication is improved with other well-tested tools like SBAR – situation, background, assessment, and recommendation (AHRQ, 2013). Situational monitoring involves the acronym “STEP – status of the patient, team members, environment, and progress toward goals” (AHRQ, 2013, p. 21). Mutual support involves team members providing support and monitoring for matters of concern such as burnout and distress in coworkers (AHRQ, 2013). TeamSTEPPS® involves a series of acronyms, briefings, and debriefings designed to facilitate better communication and create a culture of safety (AHRQ, 2013).

The staff’s perception of teamwork was examined at a surgical center in the south central region of the country with the goal of reducing handling errors by refining the “sign out” portion of Universal Protocol™. Joint Commission (n.d.) developed Universal Protocol™, a series of safety checklists before and after invasive procedures, to prevent “wrong site, wrong procedure, and wrong person surgery” (para. 1). Plonien and Williams (2015), Steelman (2015) emphasized that teams communicate and make better decisions than individuals. Operating rooms were

found to be high stress environments characterized by incivility and hierarchal in structure with the surgeon as the head of the team (Burgess & Curry, 2014; Castner, Ceravolo, Foltz-Ramos, & Wu, 2013; Clark & Kenski, 2017; Shams et al., 2016). Joint Commission uncovered more than two-thirds of adverse surgical events were due to poor communication (Tibbs & Moss, 2014). The errors pertaining to specimen handling that occurred between April and December 2017 were the result of lack of communication between circulating nurses and surgeons during the “sign out” portion of Universal Protocol™. In response to this clinical problem, the PICOT question was asked: In the OR, will implementing TeamSTEPPS® decrease specimen handling errors? The fourfold aim was to: (1) improve communication and teamwork, (2) increase compliance with the “sign out” portion of Universal Protocol™ to 100 percent per organizational goals, (3) decrease specimen handling errors resulting in sentinel events to two or less postimplementation, and (4) improve patient outcomes by reducing the chances that patients will have delayed diagnoses and additional surgeries related to mishandling of specimens.

Use of evidence- based practice (EBP) such as TeamSTEPPS® to enhance communication can decrease costs and improve patient outcomes (Melnyk, Fineout-Overholt, & Giggelman, 2016; Melnyk, Gallagher-Ford, & Long, 2014). This project is relevant to nursing because nurses communicate with the healthcare team regularly and coordinate activities related to patient care. The circulating nurse’s role following a surgery is to confirm what was done and how specimens should be handled. With improved communication, nurses can provide safe and efficient care to patients.

### **Problem Description**

Not all surgeries require handling specimens; however, when specimens are collected, they must be handled properly to prevent sentinel events. Joint Commission (2013) defines a

sentinel event as “an unexpected occurrence involving death or serious physical or psychological injury” (p. SE-1). Between April and September of 2017, five errors resulting in sentinel events occurred (per event reports on the company’s intranet). Though few, when these errors occur, there is a cost to patient and the organization because they lead to delay in diagnosis and additional surgeries (Van Wicklin, 2015). Preimplementation practice within the unit involved verbal confirmation of the “sign out” between the circulating nurse and the surgeon. The circulating nurse was responsible for filling out a specimen form, attaching it to the specimen, and taking it to the laboratory. Audits of “sign outs” have shown a decrease in confirming specimens from 100 percent compliance in April 2017 to 96.5 percent compliance in August 2017. Upon root-cause analysis in each of the five instances, both the surgeon and the circulator admitted that no “sign out” was performed, and no specimen handling was confirmed after the cases.

This gap in practice is not just a problem at the chosen facility. Performing a “sign out” is indicative of appropriate communication, and not performing a “sign out” is indicative of improper communication. Multiple studies show the perioperative arena to be one of the most aggressive and dysfunctional in the field of nursing, characterized often by bullying and disrespect, and one in which team members are afraid to report errors for fear of reprisal (Cochran & Elder, 2015; Makary et al., 2006; Morath, Filipp, & Cull, 2014). The hierarchal nature of the arena, with the surgeon as the head of the team, affects teamwork.

Makary et al., 2006; Morath et al., 2014 demonstrated that surgeons may have a positive perception of teamwork in contrast to the negative perception of teamwork by the nurses. Research per Makary et al. (2006) is germane to this project because the study was

groundbreaking in identifying the dysfunctional environment of the surgical arena and the divide between nurse and physician perceptions. The problem with the hierarchal nature of the environment is that individual decision-making does not allow for others to have input. It has been recognized that teams make better/safer decisions and allow for other team members to feel it is safe to speak up when concerned about patient safety or improper practice (Cochran & Elder, 2015; Plonien & Williams, 2015; Steelman, 2014). The Department of Health and Human Services Agency for Healthcare Research and Quality and JC recommend standardized protocols, checklists, and team training as methods of improving communication and preventing adverse events in the perioperative arena (Tibbs & Moss, 2014). Yet, these strategies are not always utilized.

The purpose of this project was to improve communication during the “sign out” and improve patient outcomes by refining the process with a “sign out” checklist (see Appendix A) in addition to the verbal confirmation and audits (paper and observational) to track compliance to the “sign out” portion of Universal Protocol™. To trace whether specimens were correctly documented on the pathology form, laboratory technicians performed audits. The audits were designed to increase the team’s accountability regarding confirming specimens after procedures.

### **Available Knowledge**

Current literature supports implementing TeamSTEPPS® as an intervention that would improve communication, reduce adverse events, and provide patient safety related to specimen handling in the OR. Key words search included: adverse events, briefing/debriefing/checklists, burnout, collaboration/interdisciplinary care culture of safety, education, efficiency, incivility, perceptions of teamwork, specimen handling errors, TeamSTEPPS®, and Universal Protocol™.

The initial search yielded 3,310 articles. Search strategy was further limited to medical/nursing journals, peer-reviewed, published in 2013 to present, and in the English language. Fifty-two articles were reviewed, with 17 omitted due to being informative in nature and not containing statistics of any kind. Of the 35 remaining articles, three were case studies, five were literature reviews, one was a mixed method qualitative/quantitative analysis, six per PI projects, one a quality improvement (QI) project, 15 were qualitative studies, three were quantitative studies, and one was a systematic review. The 35 articles relevant to the topic are included in the review of literature. No studies were identified that exclusively focused on the “sign out” portion of Universal Protocol™, and this represents a gap in the literature.

### **Critical Appraisal of Selected Evidence/Rapid Appraisals of Checklists**

Based on the Association of perOperative Registered Nurses’ (AORN’s) (2016) Evidence Rating Model, the mixed method qualitative/quantitative analysis and quantitative analysis rate 2 (high level of evidence) A (high quality). Qualitative studies and PI projects rate 3 (moderate level of evidence) B (good quality). Case studies and literature reviews rate 4 (limited) C (low quality). Per the AORN’s (2016) Hierarchy of Evidence, scholarly literature is rated I (highest level) to V (lowest). The mixed method qualitative/quantitative analysis and quantitative analysis rate II, qualitative studies and PI projects III, and case studies/literature reviews rate V. Case studies and literature reviews were useful in that this literature reinforced conclusions made in research studies.

### **Adverse Events**

The most emphasized topic in the literature focused on preventable adverse events, such as the specimen handling errors described, and the link to poor communication. The top two

causes of sentinel events were poor communication and ineffective leadership as identified by JC (Burgess & Curry, 2014; Cabral, Eggenberger, Keller, Gallison, & Newman, 2016). Poor teamwork is also a contributing factor to adverse events (Castner et al., 2013). In 1999, the Institute of Medicine (IOM) estimated that 98,000 people die in hospitals due to preventable errors and recent reports suggest that number has grown to 400,000 (Godlock, Mitner, & Sullivan, 2017; Sweigart et al., 2016). Steelman (2014) pointed out that 30 percent of hospitalized patients suffered adverse events, and surgical errors such as wrong sites and wrong procedures in the OR are the ones most reported to JC.

Seventy-five thousand people die annually because of surgical errors (Stewart, Manges, & Ward, 2015). These errors result in 750 billion in preventable cost, but evidence also showed these errors decreased when teams work well together and respect each other (Castner et al., 2013; Stewart, Manges, & Ward, 2015). The AORN, IOM, and JC recommend interventions that encourage transparency and standardization for improving patient outcomes and teamwork (Natafagi et al., 2017). A review of recent literature regarding specimen handling showed recurring emphasis on lack of standardization of practices in the processing of specimens, causing errors (D'Angelo & Mejabi, 2016; Hicks, 2014; Lee, 2014; Shirey & Perrego, 2015; Van Wicklin, 2015).

### **Briefing/Debriefing/Checklists**

The AHRQ (2013) developed TeamSTEPPS®, which involves briefings, debriefings, and checklists. TeamSTEPPS® is the result of more than 25 years of research (Plonien & Williams, 2015). Yet, checklists are not unique to TeamSTEPPS®. A study completed by Cabral et al. (2016) evaluated an OR staff's safety attitudes after implementation of the World Health



Organization (WHO) Surgical Safety Checklist (SSC) and saw statistically significant improvements in the attitudes of nurses, surgeons, and surgical technicians after implementation. Similarly, Kleiner et al. (2014) used a modified WHO SSC to improve briefings and debriefings in the OR.

Weld et al. (2016) noted interventions that formalize the briefing and debriefing process in the OR create high reliability organizations (HROs) and enhance patient safety. The “sign out” and laboratory auditing forms developed are in line with these recommendations, and the goal was to increase compliance with “sign out” and the correct process of specimen handling (confirming the specimen with the surgeon and filling out all necessary information on the pathology form). D’Angelo and Mejabi (2016) recommended having one standard pathway for handling specimens and using methods such as color coding to make the process less complex. Schmidt, Messinger, and Layfield (2013) suggested computer entry by providers to decrease confusion and mistakes regarding specimen handling.

## **Burnout**

Burnout is something that does not enhance patient outcomes and safety. Castner et al. (2013) asserted that a nurse’s job commitment and likelihood of attrition are strongly correlated with teamwork. Kleiner et al. (2014) also mentioned the negative effect of staff workload on the frequency of sentinel events. Li (2013) used the Teamwork Attitudes Questionnaire (T-TAQ) to compare nurse and physician perception of teamwork, finding nurse perception to be more negative and noted that the intense workload the nurses face has a direct effect on these perceptions. D’Angelo and Mejabi (2016) employed the Lean method to identify and reduce the risk of specimen errors but conceded staff could suffer burnout due to increased workload when

Lean standards, such as using fewer resources and changing existing processes, are applied to nurse workflow.

### **Collaboration/Interdisciplinary Care**

Collaboration and interdisciplinary care are especially crucial in the OR. Garrett (2016) noted: “The OR is a dynamic fluid environment requiring adaptability and cross-functional collaboration across departments and disciplines throughout the patient’s continuum of care” (p. 113). In the OR, several different disciplines such as anesthesiologists, nurses, nurse anesthetists, and surgical technicians work together in the same room during a surgery. Healthy collaboration is crucial to patient safety. Godlock, Miltner, and Sullivan (2017) asserted that 60 percent of perioperative nurses surveyed did not report encouraged collaboration in the OR and felt it unsafe to speak up when concerned about patient safety. Shirey and Perrego (2015), Van Wicklin (2015) recommended utilizing interdisciplinary teams as a method of preventing specimen handling errors in the OR.

### **Culture of Safety**

The concept of establishing a culture of safety recurred frequently and advocated TeamSTEPPS® as an intervention was a means to establish such a culture (Godlock et al., 2017; Kleiner et al., 2014; Li, 2013; Steelman, 2014). Castner et al. (2013) acknowledged the importance of leadership and well-planned change on establishing a culture of safety, placing emphasis on positive leaders who will communicate and encourage transparency amongst frontline healthcare workers. Establishing a culture of safety includes empowerment of staff and transformational leadership (Burgess & Curry, 2014; Godlock et al., 2017). Transformational leaders inspire staff to do the best work by providing an idealized influence (Giltinane, 2013).

Vertino (2014) noted that transformational leaders are found in HROs. Castner et al. (2013) acknowledged that such leadership is a catalyst for good teamwork. Burgess and Curry (2014) used transformational leadership as the theoretical framework for their implementation of workshops on communication. Multiple studies show that staff members who are not empowered might be afraid to speak up even with patient safety concerns (Burgess & Curry, 2014; Clark & Kenski, 2016). TeamSTEPPS® provides communication strategies to empower staff and encourage those on the frontline of patient care to speak up using techniques such as the two-challenge method. For example, a nurse asks a physician for clarification and the request is ignored at this point. The nurse engages another colleague such as a supervisor to resolve the problem in a nonconfrontational manner (Garrett, 2016).

### **Education**

Brent (2015) used education as one of the interventions in a PI project designed to decrease specimen misidentification and as a result reduced specimen labeling errors by 62 percent. D'Angelo and Mejabi (2016) employed the Lean method to a similar PI project and recorded a video of the proper specimen verification to train staff. Schmidt, Messinger, and Layfield (2013) identified the complexity of the specimen handling process as a root cause of errors and pointed to the necessity of education of staff as an intervention. Shirey and Perrego (2015) used education as an intervention, using mandatory staff meetings with question and answer sessions as a method to standardize specimen handling and staff education.

Wheeler et al. (2013) used simulation training to improve team communication and coherence. This method was also used to detect latent safety threats within staff. Castner et al. (2013) illustrated that communication training correlated with leadership attributes. Burgess and

Curry (2014) emphasized the importance of leadership to patient safety and focused on staff educators. Riggall and Smith (2015) used communication training to educate a variety of staff (nurses, patient care technicians, residents) with different levels of clinical experience. Based on the literature which supports this action, an in-service component was included in this intervention.

### **Efficiency**

While numerous organizations advocate using TeamSTEPPS®, some are concerned that implementation will have a negative effect on efficiency. Garrett (2016) affirmed that one of Institute for Healthcare Improvement (IHI) and IOM's Triple Aim tenets is reducing cost of care. In an OR, there is a strong emphasis on getting into a room on time, clearing and cleaning a room quickly to prepare for the next case. Budget is more crucial than ever in healthcare (Li, 2013; Shams et al., 2016; Stewart, Manges, & Ward, 2015). In a quantitative study examining thousands of surgical procedures, Shams et al. (2016) found no significant decrease in efficiency. After implementation of TeamSTEPPS® at an otolaryngology department of a tertiary care medical center, it was revealed that efficiency was maintained. Weld et al. (2016) showed that TeamSTEPPS® implementation improved efficiency as case times decreased an average of 12.7 minutes and in-room first start cases improved by 21 percent. The fear that TeamSTEPPS® will disrupt surgical efficiency is seemingly unfounded. Hicks (2014) used PI to decrease the amount of time between collection of the specimen and placement in preservative from 138 minutes on average to 40 minutes. Hicks (2014) improved efficiency with the collaboration of laboratory technicians; therefore, laboratory technicians were included in the intervention.

## **Incivility**

Clark and Kenski (2017) define incivility as “the display of a range of rude or disruptive behaviors and failing to take action when action is warranted or justified” (p. 60). Burgess and Curry (2014) listed several of the behaviors in the perioperative arena that impair communication: “bullying, incivility, verbal abuse, insulting or disparaging remarks, sabotage and professional terrorism” (p. 529). Such behaviors lead to staff unwillingness to speak up when patient safety is in question. For example, in the five specimen handling errors, the circulating nurses could have been afraid to enforce the protocol of the “sign out.” Cabral, Eggenberger, Keller, Gallison, and Newman (2016) recommended briefings and debriefings as methods of empowering staff to speak up when concerned about patient safety. Castner et al. (2013) suggested using educational workshops with the aim of understanding and preventing incivility.

Kleiner et al. (2014) identified breakdown in communication as the root cause of many medical errors and sentinel events. Vertino (2014) asserted that poor communication can lead to hostility among team members and horizontal violence, sometimes called lateral violence. Lateral violence is defined as “behaviors intended to demean, undermine, and/or belittle a targeted individual working at the same professional level” (Sanner-Stiehr & Ward-Smith, 2016, p. 113). Implementing TeamSTEPPS® can improve communication and as a secondary effect, decrease lateral violence. Castner et al. (2013) identified emotional exhaustion, a result of such lateral violence, and noted emotional exhaustion can cause adverse events. Empowerment of staff, a characteristic of Magnet™ hospitals, through interventions, which encourage open communication, correlates with positive patient outcomes and combats incivility (American Nurses Credentialing Center, 2015).

An additional reason communication is often deficient in the OR is the hierarchal nature of the environment with staff sometimes afraid to question the surgeon, the head of the team (Clark & Kenski, 2017; Garrett, 2017; Godlock et al., 2017). Kleiner et al. (2014) indicated the hierarchal nature of healthcare in general contributes to errors and near misses, such as the five specimen handling errors resulting in sentinel events at the facility chosen for this project. The primary reason for developing a culture of safety is that interdisciplinary teams make decisions together (Godlock et al., 2017). The reliance on surgeons to make all decisions is out of date. A modern view of the interdisciplinary team involves a more democratic approach in which each interdisciplinary member provides insight into what decisions are made for the patients (Plonien & Williams, 2015).

### **Perceptions of Teamwork**

Makary et al. (2006) identified a possible cause of lack of communication in the OR: negative perception of teamwork from circulating nurses juxtaposed with positive perceptions of teamwork from surgeons. Evaluation tools such as T-TAQ and T-TPQ have been used in multiple studies (Gaston & Short, 2016; Li, 2013; Riggall & Smith, 2015; Sweigart et al., 2016; Tibbs & Moss, 2014; Vertino, 2014). Castner et al. (2013) tested the reliability of the T-TPQ, finding a total reliability of 0.93, and advocated for using this tool to gauge staff perceptions of teamwork. Castner et al. (2013) showed TeamSTEPPS® positively affected all five dimensions of teamwork amongst participants (team structure, leadership, situational monitoring, mutual support, and communication), and TeamSTEPPS® training was related to higher leadership scores. Li (2013) discovered a strong correlation exists between teamwork climate and safety attitudes.

Multiple authors asserted that formal communication training improved staff perceptions of teamwork (Gaston & Short, 2016; Riggall & Smith, 2015; Roman et al., 2016). Though, Spiva et al. (2014) saw no statistically significant increase in teamwork attitudes, they did achieve the sought outcome upon implementation of decreasing patient falls by 62 percent. Li (2013) discovered that nurse perceptions of teamwork were lower than physicians, echoing previous findings from Makary et al. (2006). Similarly, Cabral, Eggenberger, Keller, Gallison, and Newman (2016) correlated the participant's profession with the amount of improvement in perception of teamwork as nurse perceptions improved by six percent, four percent for surgeons, and 2.3 percent for surgical technicians after implementation of WHO SSC.

Essential to patient safety is teamwork. Castner et al. (2013) acknowledged that teamwork or lack thereof is the best predictor of the time a surgical procedure takes and surgical errors. Harvey et al. (2013) tested the effect of TeamSTEPPS® implementation on response to resuscitation need and found sustained improvement in the level of teamwork among staff. Gaston and Short (2016) used a mixed method design and found that staff perceptions of teamwork were improved on the T-TPQ and the Hospital Survey on Patient Safety Culture (HSPSC). Spiva et al. (2014) saw increases in HSPSC scores upon implementation of TeamSTEPPS®. Roman et al. (2016) applied the model to long term care (LTC) and saw significant improvement in team communication at LTC facility. Change agents have proved the adaptability of using TeamSTEPPS® to improve teamwork in multiple settings.

### **Specimen Handling**

Approximately 17 percent of specimen misidentifications result in inappropriate treatment for the patient, and six percent result in sentinel events (D'Angelo & Mejabi, 2016).

Lee (2016) found that such events are underreported. A root cause for specimen handling errors found in multiple studies was lack of standardization and use of decades-old procedures for the process (D'Angelo & Mejabi, 2016; Lee, 2016; Shirey & Perrego, 2015). After performing a retrospective review of 648 surgical specimen events, Steelman et al. (2016) found the most common errors occurred with the labeling of the specimens in the prelaboratory phase. In the OR, the circulating nurse labels the specimen before it is taken to the laboratory. Van Wicklin (2015) pointed out the importance of the circulating nurse in ensuring accuracy of the specimen and advocating for their surgical patients.

### **TeamSTEPPS®**

Stewart et al. (2015) examined two methods of implementation of TeamSTEPPS®, one method in which the change agent implements the intervention generically and does not tailor the program to the site and the second method in which the change agent thoroughly researches TeamSTEPPS® and tailors the intervention specifically to the facility. Those who implemented TeamSTEPPS® using the second approach were able to establish sustained change in teamwork among staff. Tibbs and Moss (2014) applied the TeamSTEPPS® concept to a rural community hospital OR and saw not only better teamwork perceptions, but increased compliance to Universal Protocol™ therefore reinforcing the idea that teams make better decisions than individuals.

### **Universal Protocol™**

Although studies have shown a decrease in surgical sentinel events after implementation of Universal Protocol™, these events still occur and when they do, the consequences are potentially disastrous (Paull et al., 2015). In response to sentinel events in the OR, Paull et al.



(2015) performed root cause analyses of 48 cases of wrong surgical events, finding one of the major errors to be incorrectly labeled specimens, and concluded that these errors could have been prevented with strict adherence to Universal Protocol™. Lipshy (2016) recommended staff training and developing a standardized workflow, as the project leader proposed, to prevent deviance from Universal Protocol™.

### **Summary of Literature**

Adverse events, such as specimen handling errors, are a nationwide problem. In 1999, IOM approximated that 98,000 people die in hospitals due to preventable errors and that number may have grown to 400,000 in recent years (Godlock, Mitner, & Sullivan, 2017; Sweigart et al., 2016). Steelman (2014) pointed out that 30 percent of hospitalized patients suffered adverse events, such as specimen handling errors. Seventy-five thousand people die annually because of surgical errors, resulting in 750 billion in preventable cost (Stewart, Manges, & Ward, 2015). Several factors cause these events, one is the lack of communication required by Universal Protocol™.

Castner et al. (2013) tested the correlation of control over practice and experience and found no statistical relationship between the two. An individual's experience had little to do with control over practice. Yet, those with more control over practice tested better with regards to the five dimensions of teamwork. Castner et al. (2013) illustrated that communication training correlated with leadership attributes. Burgess and Curry (2014) applied the TeamSTEPPS® model to staff educators, Riggall and Smith (2015) applied the model to a variety of staff (nurses, patient care technicians, residents) with different levels of clinical experience, and Sexton and Baessler (2016) tested the model on students. Participants achieved improvement in

communication and teamwork no matter the level of experience. Control over practice and leadership are attributes that have less to do with experience and more to do with receptiveness to the use of EBP. Nurses and other healthcare providers of varying levels of experience and expertise can benefit from team training.

Change agents can use a variety of methods to disseminate information on positive methods of communication. Garrett (2016) advocated for acronyms like CUS (Concerned Uncomfortable Safety), I Pass the Batton (Introduction Patient Assessment Situation Safety Background Action Timing Ownership Next Steps), and SBAR. Staff can use these tools with ease and can print them on small cards and carry them as guides during a shift. Riggall and Smith (2015), Sexton and Baessler (2016) used simulation as a relatively inexpensive, effective way to communicate the ideas through action. Burgess and Curry (2014), Castner et al. (2013) established workshops to communicate the TeamSTEPPS® model. Kleiner et al. (2014) utilized coaching and an outside observer to test staff compliance to the principles. There are also a variety of tools to test effectiveness of communication interventions such as HSPSC, T-TAQ, and T-TPQ.

TeamSTEPPS® has been implemented in a variety of locations and specialties. Studies were conducted in Colorado, Florida, Iowa, New York, North Carolina, and Taiwan, to name a few (Burgess & Curry, 2014; Cabral et al., 2016; Li, 2013; Natafqi et al., 2017; Roman, Abraham, & Deever, 2016). TeamSTEPPS® has shown adaptability in a variety of specialties including academic health centers, acute care, LTC facilities, ORs, professional schools, and trauma centers (Gaston & Short, 2016; Harvey et al., 2013; Roman, Abraham, & Deever, 2016; Sexton & Baessler, 2016). Natafqi et al. (2017), Stewart et al. (2015) performed studies in rural

areas. Others chose large, urban facilities. TeamSTEPPS® is one of the most widely adopted interventions for improving communication and teamwork (Shams et al., 2016; Weld et al., 2016).

One must have a well-researched, strategic plan for implementation of change that tailors the intervention to the facility/location. Zhu et al. (2016) asserted that leaders who were more deliberate with planning, familiarized themselves with the concepts of PI interventions, and tailored the intervention to the specific facility implemented and achieved sustained change. Garrett (2016) concurred that a mixed approach allows ideas to flow up and down freely from administrators to frontline staff and vice versa. Lipshy (2016) echoed the importance of focusing on both the top tier and the frontline staff when conducting PI. Because implementers are often nurse leaders, it is important to note that effective leadership is a catalyst for teamwork (Castner et al., 2013). Stewart et al. (2015) added that a combination of the top-down (change initiated by administrators) and bottom-up (change initiated by frontline staff) had the best results in implementation, backing up the assertion that a more specific approach is better. TeamSTEPPS® was designed so that a multitude of businesses could customize the program to fit specific needs (Gaston & Short, 2016).

Review of the literature revealed that TeamSTEPPS® is an effective, evidence-based solution to the problems of poor communication and teamwork. Multiple practitioners of various levels of experience can benefit from team training. The intervention is adaptable to numerous areas of practice as well. Those looking to implement TeamSTEPPS® also have a variety of tools (such as T-TAQ and T-TPQ) to test the effectiveness of the intervention. Change agents should also tailor the intervention to fit their facility's specific needs. Nursing and

TeamSTEPPS® are interrelated in that nurse leaders are often the ones implementing TeamSTEPPS®. Frontline nurses are trained as a result.

### **Rationale**

When implementing change, the change agent must have a solid plan for implementation (Mitchell, 2013). When planning is more deliberate and specific to the setting, change is more likely to last (Zhu et al., 2016). The PICOT question asked: In the operating room, will implementing TeamSTEPPS® decrease specimen handling errors? This question requires a step-by-step method of examining the problems and testing an intervention grounded in EBP.

The Iowa Model of EBP was chosen as the framework for this PI intervention. The Iowa Model of EBP utilizes the concepts of triggers, priority of the topic, formation of a team, assemblage of relevant research, critique/synthesis of research, a piloting of the proposed change, and adoption in practice (White & Spruce, 2015). The process of identifying triggers was especially helpful. Sentinel events have occurred involving improper processing of surgical specimens. The PICOT question and the decision to implement TeamSTEPPS® came about because of these events.

The Iowa Model is intuitive when engaging in PI and implementing change. The Iowa Model is also ideal for the dynamic and fast-paced perioperative arena, which involves interdisciplinary care. Multiple disciplines such as anesthesiologists, nurses, nurse anesthetists, and surgical technicians are involved with the care of the surgical patient. With all the disciplines following these standardized steps to implementing change, the team will be more likely to achieve sustained change.

Use of the Iowa model of EBP has support in multiple studies. White and Spruce (2015) utilized the Iowa Model of EBP for a project implementing clinical practice guidelines in the perioperative area and noted that this model could be used in multiple clinical settings. Lloyd, D'Errico, and Bristol (2016) advocated using the Iowa Model for DNP projects as the Iowa Model can be utilized for a variety of topics.

The Iowa Model of EBP can be superimposed with two change theories, Kurt Lewin's Theory of Planned Change which involves "phases of unfreezing, moving (or transitioning), and refreezing" (Shirey, 2013, p. 69) along with Ronald Lippitt's change theory. Lippitt's theory has seven phases including diagnosing the problem, evaluating motivation for change, assessing the resources available for change, selecting a change objective, choosing a change agent, maintaining change, and terminating the helping relationship (Mitchell, 2013). Lippitt's theory, like the Iowa Model of EBP, mirrors the nursing process in which nurses are prompted to use critical thinking skills.

Mitchell (2013) suggested that Lewin's and Lippitt's theories can be used together with Lippitt's phases of diagnose the problem, assess motivation and capacity for change, and assess the change agent's motivation and resources corresponding with Lewin's "unfreezing" stage. Lippitt's phases of selecting progressive change objective, choosing change agent, and maintaining change corresponding with Lewin's "moving" phase. Lippitt's concept of ending the helping relationship after sustained change coincides with the "refreezing" phase (Mitchell, 2013). These theories also work well with the Iowa Model of EBP with the triggers, priority of topic, formation of team, assemblage of research, and critique/synthesis of research

corresponding to the “unfreezing” stage, piloting of proposed change corresponding with the “moving” stage, and adoption of practice with the “refreezing” stage.

The Iowa Model can be utilized to further the aim of improving staff perception of communication and teamwork because this method involves examining a specific working environment in the step of identifying triggers. Zhu et al. (2016) noted that leaders who were more deliberate with planning, familiarized themselves with the TeamSTEPPS® concepts, and tailored the intervention to the specific facility implemented and achieved sustained change. The Iowa Model facilitates deliberate planning with the identification of specific triggers at the facility.

### **Variables**

The TeamSTEPPS® intervention is the independent variable. Staff perceptions of communication and teamwork are the dependent variables. Communication is defined as “the imparting or interchange of thoughts, opinions, or information by speech, writing, or signs” (*Dictionary.com*, 2018). Teamwork is defined as “cooperative or coordinated effort on the part of a group of persons acting together as a team or in the interests of a common cause” (*Dictionary.com*, 2018). For an OR, the common cause is patient safety. Laboratory technicians audited pathology forms; operational variables are complete documentation or incomplete documentation. For instance, the laboratory technicians noted if the nurse dated the forms, specified handling (i.e. frozen, permanent, culture), specified phone number of OR suite, and wrote the OR suite from which the specimen came. Observational auditors illustrated whether the “sign out” was complete or incomplete per Universal Protocol™.

## **Assumptions**

This PI project had three assumptions. The first assumption was that staff perceptions of communication and teamwork would improve three months after implementation of TeamSTEPPS®. The second assumption was that specimen handling errors would decrease. The third assumption was that the staff would adhere to “sign out” and Universal Protocol™ policies and protocols.

## **Specific Aims**

The aims of the project are four-fold and based on the PICOT question: In the operating room, will implementing TeamSTEPPS® improve communication and decrease specimen handling errors? The four-fold aim is: (1) improve communication and teamwork, (2) increase compliance with the “sign out” portion of Universal Protocol™, (3) decrease specimen handling errors, and (4) improve patient outcomes by reducing the chances that patients will have delayed diagnoses and additional surgeries related to mishandling of specimens. Based on evidence from the literature, it was believed that improving communication and teamwork would have the cascade effect of decreasing sentinel events and improving compliance to Universal Protocol™.

## **Methods**

### **Context**

This 150-bed surgical center contains six OR rooms. There are 3000 to 3300 various surgeries performed annually. These surgeries include general surgery, heart surgery, neurosurgery, and plastic surgery. The population included nurses and surgeons working in the OR, the main participants in the “sign out” after surgeries. The project used a purposive sample of nurses, surgeons, surgical technicians, and anesthesia technicians working in the OR.

Purposive sampling is “the deliberate choice of a participant due to the qualities the participant possesses” (Etikan, Musa, & Alkassim, 2016, p. 2). Within this project, the qualities the participants possess is employment within the facility and contribution to the culture on the unit. The culture within the facility has been influenced by organizational downsizing, which has included closing the cafeteria on weekends, closing the gift shop, and an increasing focus on productivity. As staff was already coping with these changes, they were resistant to further change, which was a major barrier to the project. As the project involved in-services during working hours, no financial support was required, but leadership, including the Director of Surgical Services and the department manager, supported the project by arranging the times for in-services.

Stakeholders included the Director of Surgical Services, the facility’s quality control manager, and the chief medical officer who attended TeamSTEPPS® leadership training before project implementation. Other stakeholders included surgeons, circulating nurses, and laboratory technicians within the facility. Because of the project, circulating nurses, laboratory technicians, and surgeons became more aware of the necessity of the “sign outs” through audits. Laboratory technicians were invested in the project because they must seek out circulating nurses when specimens are mislabeled, disrupting workflow.

There were many incentives tied to using the “sign out” and Universal Protocol™, which included reduction in error, patient safety improvement, more effective communication, and medical cost to the facility decreasing with the decrease in specimen errors. Approximately 17 percent of specimen misidentifications result in wrong therapy for the patient, and six percent result in sentinel events (D’Angelo & Mejabi, 2016). Lack of standardization is commonly



emphasized as a root cause for these errors (Hicks, 2014; Lee, 2016; Shirey & Perrego, 2015). Poor communication and teamwork have been linked to adverse outcomes (Tibbs & Moss, 2014). Multiple organizations such as AHRQ, AORN, and JC recommend team training as a way of decreasing adverse events in the OR (AHRQ, 2013; Plonien & Williams, 2015; Steelman, 2014; Tibbs & Moss, 2014). Staff who have effectively learned to use the tools of communication, as taught in TeamSTEPPS® training, could be less stressed and have improved job performance.

Adverse events result in 750 billion in preventable cost annually (Stewart, Manges, & Ward, 2015). Misidentification of specimens is 100 percent preventable. Medicare and Medicaid, from which hospitals receive the largest amount of payments, will no longer reimburse for conditions acquired in hospitals and preventable errors such as misidentified specimens (Centers for Medicare and Medicaid Services, 2015). Upon retrospective review of 648 specimen handling errors, Steelman et al. (2016) emphasized that eight percent of these errors resulted in the need for additional treatment and harmed the patients. This project is reflective of IHI's (2017) Triple Aim: "improving the patient experience of care (including quality and satisfaction, improving the health of populations, and reducing the per capita cost of healthcare" (para. 1).

### **Interventions**

The project design utilized the PDCA (plan, do, check, act) method, a four-step cyclical process involving (1) identifying a problem and building objectives and desired outcomes in response, (2) deciding on an implementation strategy, (3) initiating the plan, and (4) evaluating the results (Holly, 2014). The PDCA cycle "guides continuous process improvement" and was chosen by the project leader because clinical ladder nurses employed at the facility are required

to use this method for mandatory yearlong QI projects (Brent, 2016, p. 166). As clinical ladder nurses served as champions and participated in the project, PDCA was appropriate and convenient.

**Setting.** This 150-bed surgical center contains six OR rooms. There are 3000 to 3300 various surgeries performed annually. These surgeries include general surgery, heart surgery, neurosurgery, and plastic surgery.

**Exclusion/inclusion criteria.** The population included anesthesia technicians, nurses, surgeons, and surgical technicians working in the OR. The project leader used a purposive sample of employees of the facility, which involved deliberately choosing a specific population to ground the work in one practice setting. Anesthesiologists and nurse anesthetists were not included because they are not employed at the facility but contracted through another company. Pathology forms audited were limited to OR, as catheterization laboratory and endoscopy are separate departments. Procedure “sign outs” were only observed in the OR, as the purposive sample was focused on surgical staff.

**Planning phase.** Planning included meeting with stakeholders: staff nurses, the chief medical officer, the Director of Surgical Services, and the quality control manager. Baseline audits of the “sign out” already existed. Laboratory technicians began baseline audits and continued after implementation. The project leader obtained permission from the Chief Nursing Officer before implementation.

**Implementation phase.** The project leader proposed to enhance the communication between OR nurses and surgeons by using the TeamSTEPPS® skill of “cross-monitoring” which involves “watching each other’s back” and ensuring mistakes are caught “quickly and easily”

(AHRQ, 2013, p. 23). To do so, the project leader created a “sign out” checklist that the circulating nurse used to complete the “sign out” (see Appendix A). The surgeons were made aware their compliance with the “sign out” would be verified on the checklist. Nurses and surgeons were made aware of the results of the audits through employee email and during monthly department meetings. The project leader performed monthly in-services regarding the cross-monitoring and “sign out” concepts. A poster display was created and displayed in the department breakroom, and employees signed a roster after viewing.

**Practice recommendations.** The methods of the intervention aligned with practice recommendations. The AORN, IOM, and JC recommended interventions that encourages transparency and standardization for improving patient outcomes and teamwork (Natafgi et al., 2017). A review of recent literature regarding specimen handling errors showed that lack of standardization of practices in the processing of specimens caused errors, such as misidentification (D’Angelo & Mejabi, 2016; Hicks, 2014; Lee, 2014; Shirey & Perrego, 2015; Van Wicklin, 2015; Steelman et al., 2016).

Champions of the implementation included the project leader and clinical ladder nurses in the surgical department. The Director of Surgical Services, the facility’s quality control manager, and the chief medical officer have completed TeamSTEPPS® training for leaders and offered clinical education units (CEUs) to nurses, surgeons, and other OR staff through an eight-hour TeamSTEPPS® fundamentals course on-site. Staff also had the option of completing TeamSTEPPS® modules on the AHRQ website for additional CEUs.

Laboratory technicians attended an in-service and were given instructions on what to audit. The laboratory technicians were to track compliance related to the forms being filled out

correctly, incorrectly, and if documentation was complete or incomplete (see Appendix B). Circulating nurses documented the specimen handling and had greater motivation to do so correctly, given they were audited by laboratory technicians. Doing so employed the TeamSTEPPS® skill of cross monitoring, in which team members monitor each other to prevent mistakes (AHRQ, 2013). Implementation steps included:

- 1) Staff viewed an educational *PowerPoint* presentation which addressed applying TeamSTEPPS® concepts to the “sign out” and informing staff of audits focusing on this portion of Universal Protocol™. This was presented to staff during a monthly staff meeting and reinforced in monthly in-services. Question/answer sessions addressed the audits and new expectations regarding the “sign out.”
- 2) To increase awareness/transparency the “sign out” sheet, OR nurses began using a “sign out” sheet placed on the front of the chart to track compliance to “sign out” (see Appendix A).
- 3) Observational audits of the “sign out” were performed by the champions (the project leader and participating clinical ladder nurses). The results of these audits that were collected nine weeks before implementation provided the baseline data. Postimplementation data was obtained in the nine weeks after implementation.
- 4) Laboratory technicians audited culture and pathology forms that came from the OR (see Appendix B).
- 5) The project leader assessed staff perceptions of communication via the T-TPQ (AHRQ, 2017). The T-TPQ, a Likert-type questionnaire, was used to assess the perceptions of nurses, surgeons, and supportive staff towards the five dimensions of teamwork: team structure, leadership, mutual support, communication, and situation

monitoring (Li, 2013). A paired *t* test was used to determine validity because the same amount of people filled out the questionnaire before and after introduction of TeamSTEPPS® (Plichta & Kelvin, 2013). The null hypothesis assumed that the introduction of TeamSTEPPS® would have no effect on OR teamwork and staff compliance to Universal Protocol™. The alternative hypothesis proposed that TeamSTEPPS® would positively affect OR teamwork and compliance to Universal Protocol™. The goal was a statistically significant improvement in scores as evidenced by  $p < 0.05$ .

- 6) A new policy was created on the unit requiring surgeons to sign the pathology order form, and nurses were not allowed to document verbal orders, which increased the surgeon's accountability with specimen identification and handling instructions.

### **Study of the Intervention**

#### **Measures**

This PI project was designed to (1) improve staff perception of communication and teamwork, (2) increase compliance with the “sign out” portion of Universal Protocol™, (3) decrease specimen handling errors, and (4) improve patient outcomes by reducing the chances of patients having delayed diagnoses and additional surgeries.

The T-TPQ was used to assess staff perceptions of teamwork (AHRQ, 2017). Data collection began by having all the staff members participating in this project answer a questionnaire prior to implementing the teambuilding strategies. Once the staff was trained and the project had been implemented, the T-TPQ was used to evaluate the staff members' perception of effective teamwork postimplementation and if the desired outcome of improved perception of teamwork has occurred. The T-TPQ is an appropriate tool for use in descriptive

statistics and has been used in multiple studies and validated as a reliable tool (Gaston & Short, 2016; Riggall & Smith, 2016; Tibbs & Moss, 2014). A paired *t* test was used to determine differences in the mean score of the results of the T-TPQ in the nine weeks before and after implementation of TeamSTEPPS®.

Improvement of communication between nurses and surgeons as well as compliance with the “sign out” were determined by daily audits of laboratory forms via laboratory technicians (see Appendix B) and the audits of the “sign outs” (see Appendix A). Success or failure was determined by examining whether the organization goal of 100 percent compliance with both was met. OR nurses completed daily paper audits of the “sign out” (see Appendix A), and nurse champions completed observational audits of “sign out.” Observational audits involve hospital personnel not working on the surgical case entering the OR room and observing for compliance to aspects of Universal Protocol™ such as the “time out” and “sign out.” The organizational goal was 100 percent compliance with the “sign out.”

To determine if specimen errors decreased and patient outcomes improved the organizations event reports were reviewed. The number of specimen errors resulting in sentinel events was compared to the number of errors reported as sentinel events postimplementation. To quantify the numbers and determine if there was a significant decrease in errors ratios were used. The use of ratios was beneficial because there were a larger number of specimens in the preimplementation time period than post implementation due to a decrease in the census.

### **Analysis**

Data collection began by having all the staff members participating in this project answer the T-TPQ, a Likert-type scale, as a pre-test evaluation. Employees completed the T-TPQ

questionnaires. The T-TPQ was an appropriate tool for assessing perioperative communication efficacy, for use in descriptive statistics, and has been used in multiple studies and validated as a reliable tool (Gaston & Short, 2016; Riggall & Smith, 2016; Tibbs & Moss, 2014). Cronbach's alpha coefficient of validity and reliability are noted as .70, .81, .83, .70, and .74 (Vertino, 2014). A paired *t* test was used to determine differences in the mean score of the results of the T-TPQ nine weeks before and nine weeks after implementation of TeamSTEPPS®. The T-TPQ was used to measure an individual's perceptions of the five dimensions of teamwork: team structure, leadership, mutual support, communication, and situation monitoring (Li, 2013). A paired *t* test was used to determine statistical significance with a goal of  $p < 0.05$ .

Improvement of communication between nurses and surgeons as well as compliance with the "sign out" was determined by daily audits of laboratory forms via laboratory technicians (see Appendix B) and audits of Universal Protocol™ per nurse champions. Universal Protocol™, a series of surgical safety checklists, was implemented in 2004 and remains part of the 2017 National Patient Safety Goals UP.01.01.01, UP.01.02.01, and UP.01.03.01 and thus has validity (JC, 2017). Percentages of correct and incorrect elements (OR listed, preservative time, et cetera) were assessed weekly and provided nominal data. The team also examined the numbers of adverse/sentinel events concerning specimen handling. There were five reported sentinel events related to specimen mishandling preimplementation. If a significant decrease in the ratio of specimen errors resulting in sentinel events occurred, the project would be deemed a success.

Observational auditors, nurse champions and the project leader, monitored for completion of the "sign out" by the surgeon and interdisciplinary team which includes verification of the name of the procedure, whether there were any equipment issues, concerns/special needs for the

patient, and whether the final count of instruments/radiopaque sponges/sharps was correct. Baseline data for “sign out” audits was obtained by OR observers nine weeks prior to implementation. OR nurses completed daily paper audits of the “sign out” after implementation (see Appendix A). Paper audits of the “sign out” the first nine weeks provided a baseline of nominal data, and success of the intervention was measured via percentages of compliance to the above elements of the “sign out.” The project would be deemed a success if organizational goal of 100 percent was met.

### **Ethical Considerations**

This project does not meet the federal regulations definition of human subject research. Permission to conduct this intervention was obtained from the project site and the Capella University Institutional Review Board (IRB) prior to implementing this intervention. It was determined that the project did not meet the guidelines of a research project, and IRB review was not needed. The T-TPQ questionnaires were anonymous. By filling out the surveys, participants provided implied consent. Other examples of exempt research include retrospective chart reviews and passive observation of public behavior (National Institute of Environmental Health Sciences, n.d.). The pathology audits fall under the first category. The “sign out” audits fall under the latter category.

### **Results**

Initial steps of the intervention included collection of preimplementation data and educating the staff on proper handling of specimens and “sign out” procedures. Initially, the “sign outs” were audited by observers not involved in the surgical cases, but nurses began to self-audit “sign outs” after in-services were complete. One modification was the implementation of a new unit policy requiring the surgeons to sign the pathology sheets and take accountability



for how the specimens would be handled. Improvement of staff perception of communication and teamwork, as evidenced by increased T-TPQ scores, was not achieved as the scores on the unit decreased by one percent. Twenty-three staff members completed the T-TPQ pre- and postimplementation. A paired samples *t* test was used to compare the T-TPQ results pre-intervention and post-intervention. There was not a significant difference in the scores pre- (M=125.91, SD=14.93) and postimplementation (M=128.00, SD=19.29);  $t(22) = -0.91, p=0.37$  (see Tables 1 and 2).

Table 1

*T-TPQ Preimplementation Results*

Domain	<i>n</i>	<i>Minimum</i>	<i>Maximum</i>	<i>M</i>	<i>SD</i>	<i>Variance</i>
Team Structure	23	17	33	24.78	5.19	25.74
Leadership	23	18	31	23.43	3.78	13.64
Situation Monitoring	23	18	34	24.87	3.84	14.11
Mutual Support	23	21	34	25.96	3.28	10.3
Communication	23	18	35	26.87	3.98	15.16
Overall	23	97	157	125.91	14.93	213.12

Table 2

*T-TPQ Postimplementation Results*

Domain	<i>n</i>	<i>Minimum</i>	<i>Maximum</i>	<i>M</i>	<i>SD</i>	<i>Variance</i>
Team Structure	23	11	35	25.09	5.27	26.60
Leadership	23	18	35	25.00	4.18	16.68
Situation Monitoring	23	18	35	24.43	3.80	13.82
Mutual Support	23	17	35	25.13	4.40	18.51
Communication	23	19	35	26.39	4.19	16.82
Overall	23	96	171	124.13	19.29	356.09
Percentage Change, Preimplementation to Postimplementation, Overall Score:					-1%	

Improvement in communication between the team, as evidenced by improved documentation on laboratory forms and improved compliance to the “sign outs,” was not achieved as the results were not significantly changed on most of the elements, and the organizational goal of 100 percent was not met. However, there were significant improvements on the “sign outs” initiated by nurse/surgical technician (as is required by Universal Protocol™) that increased from 71.11 to 80.95 percent, and verification of specimens, which increased from 43.33 percent to 47.62 (see Tables 3 and 4).

Table 3

*Surgical “Sign Out” Checklist Scoring, Preimplementation*

Checklist Item	Raw Score	Percentage of total
1) “Sign Out” Initiated by Nonphysician	64	71.11%
2) Surgeon Refusal of “Sign Out”	2	2.22%
3) Instrument Counts Verified	90	100.00%
4) Specimen & Instructions Verified	39	43.33%
5) Equipment Problems Addressed	2	2.22%
6) Recovery Plan Verified by Surgeon	81	90.00%
7) Anesthesia Notified of Recovery Plan	80	88.89%
8) Wound Class Verified	83	92.22%
	n=90	

Table 4

*Surgical “Sign Out” Checklist Scoring, Postimplementation*

Checklist Item	Raw Score	Percentage of total
1) “Sign Out” Initiated by Nonphysician	85	80.95%
2) Surgeon Refusal of “Sign Out”	3	2.86%
3) Instrument Counts Verified	104	99.05%
4) Specimen & Instructions Verified	50	47.62%
5) Equipment Problems Addressed	12	11.43%
6) Recovery Plan Verified by Surgeon	91	86.67%
7) Anesthesia Notified of Recovery Plan	91	86.67%
8) Wound Class Verified	86	81.90%
n=105		

Increasing compliance with the “sign out” portion of Universal Protocol™ and decreasing specimen handling errors, as well as improving patient outcomes by reducing the chances that patients will have delayed diagnoses and additional surgeries, were achieved as the number of specimen identification errors decreased from five to two, per the organization’s event reporting system. The ratios of specimen errors resulting in sentinel events and number of specimens processed were compared. There were five errors that occurred when 680 specimens were processed in the preimplementation period. There were two errors that occurred when 607 specimens were processed in the postimplementation period. The calculated ratio was 7.35 per 1000 specimens preimplementation and 3.29 per 1000 postimplementation, a significant improvement. Compliance to the “sign out” did not significantly improve; however, physician compliance to signing pathology sheets increased from 36.25 percent to 71.23 (see Tables 5 and 6).

Table 5

*Laboratory Specimen Audits, Preimplementation*

Audit Item	Raw Score	Percentage
1) Dated	78	97.50%
2) Timed	79	98.75%
3) Formalin Time Listed	64	80.00%
4) Nurse Signature	79	98.75%
5) Physician Signature	29	36.25%
6) OR Room Identified	79	98.75%
n=80		

Table 6

*Laboratory Specimen Audits, Postimplementation*

Audit Item	Raw Score	Percentage
1) Dated	71	97.26%
2) Timed	73	100.00%
3) Formalin Time Listed	57	78.08%
4) Nurse Signature	73	100.00%
5) Physician Signature	52	71.23%
6) OR Room Identified	73	100.00%
n=73		

The contextual elements that interacted with the interventions were facility downsizing, which limited the time to perform audits, and a census lower than usual during the implementation period. Decreasing sentinel events related to specimen misidentification and increased physician compliance to the signature requirement are reflective of the increased focus on correct processes emphasized within the educational intervention. An outlier of this renewed focus was resistance from some surgeons—who were then counseled by administration when audits revealed repeated noncompliance with the “sign out” and signature requirements. The

identified problem was the revelation that the Hawthorne effect, in which the person modifies the behavior and is more compliant due to the outside observer, was positively correlated with compliance to the surgical “sign out.” When nurses did self-audits, some surgeons deferred to comply, without the pressure to perform for an outside observer. Obtaining overall compliance to the “sign outs” was not achieved. What is missing is a solution to the problem of noncompliance to the surgical “sign out” and knowledge of what could lead to improvements in this area. Upon review of literature, no studies were discovered that exclusively focused on the “sign out” portion of Universal Protocol™, and this represents a gap in the literature. Further research focused on this element of Universal Protocol™ is needed.

## **Discussion**

### **Summary**

The increase in physician compliance to signature requirement was a key finding. There was a 36.25 percent compliance preimplementation and a 71.23 percent compliance postimplementation. This improvement helped to further the aim of improving patient outcomes that focuses on a component of the Triple Aim concerning safety and decreasing cost by reducing the chances that patients will have additional surgeries and delayed diagnoses related to the mishandling of specimens. Given that physicians have improved checking the pathology form and the percentage has improved significantly, the project was a success. Errors decreased from five in the preimplementation period to two postimplementation, achieving the goal of two or less errors.

An additional finding was the decrease in the T-TPQ scores by one percent. Though the overall perception of teamwork was not improved, this decrease could be the result of the organizational downsizing within the facility and its effect on employee morale. Evaluating

individual domains categorized by staff roles, surgeons were the only group to show increases in each domain, and leadership was the only domain that saw percentage increases for each staff role (see Table 7).

Table 7

*T-TPQ Postimplementation Mean Change Categorized by Staff Role*

	Scrub Tech	Anesthesia Tech	Staff Nurse	Charge Nurse	Surgeon
	N= 8	N= 2	N= 6	N= 4	N= 3
Domain					
Team Structure, Ordinal	3	-5	4	-8	13
Team Structure, Percentage	1.56%	-10.00%	2.86%	-7.69%	15.48%
Leadership, Ordinal	18	1	7	9	13
Leadership, Percentage	9.38%	2.44%	5.19%	9.78%	16.46%
Situation Monitoring, Ordinal	1	4	2	-12	6
Situation Monitoring, Percentage	0.49%	9.76%	1.49%	-11.01%	7.14%
Mutual Support, Ordinal	-1	-2	-6	-2	1
Mutual Support, Percentage	-0.47%	-4.08%	-4.17%	-2.00%	1.09%
Communication, Ordinal	3	-3	1	-9	10
Communication, Percentage	1.37%	-6.12%	0.66%	-8.41%	10.87%
Overall, Ordinal	24	-5	8	-22	43
Overall, Percentage	2.36%	-2.17%	1.14%	-4.30%	9.98%

**Interpretation**

The interventions made OR staff more aware of the importance of the “sign out” and of correct documentation on the pathology order forms. The results of the T-TPQ reflected a more positive view of teamwork per surgeons than nurses, which corroborated previous research indicating surgeons have a more positive view of OR teamwork than nurses (Makary et al., 2006; Morath et al., 2014). The project had no impact on the staff/systems improved perceptions of teamwork as evidenced by the one percent decrease in the T-TPQ scores but did impact completeness of pathology forms as evidenced by the statistically significant increase in surgeon

verification of the form by the presence of their signature. A reason the T-TPQ scores decreased is possibly more related to staff morale having been affected by company downsizing. The costs and strategic trade-offs included the lack of computerized order entry for specimen orders and having surgeons manually sign the pathology sheets. Although computerized order entry is recommended as a method of creating a safer environment for patients by decreasing specimen handling errors (Schmidt, Messinger, & Layfield, 2013), introducing new technology in the OR was not feasible at the time due to budget constraints within the organization.

### **Limitations**

Limitations were that the project was implemented at one location with a convenience sample, the chosen population was also limited to OR staff, and results may not be generalizable to other areas of healthcare. There is also a gap in the literature regarding the “sign out” portion of Universal Protocol™. There was no research found with a focus on the “sign out” and compliance to this protocol. Another limitation is that the PI project was dependent on observational audits. What is not known is the actual rate of compliance to specimen verification because a limitation of observational audits is the Hawthorne effect, in which people change behavior due to the presence of the observer (McCambridge, Witton, & Elbourne 2014). The project took place over a relatively short period of time (nine weeks pre- and postimplementation). This length of time is not enough to embed new practice into the culture of the facility. What is not known is the long-term results of the project. Additional research is needed.

### **Conclusions**

This project is useful in that the results reinforce studies regarding problems with teamwork in the OR. The sustainability can be maintained with further support from leadership,

and clinical ladder nurses will continue to use the PDCA method to refine the “sign out” and specimen handling processes. This intervention can be utilized in other contexts, as specimens are routinely collected on units such as medical-surgical and intensive care. Analysis of specimen errors in that capacity would contribute to disseminating the concepts of TeamSTEPPS®. Based on the results shown in the intervention, it is recommended that in the future order entry in the OR should be computerized.



## References

American Nurses Credentialing Center. (2015). *The ANCC Magnet™ recognition program*.

Retrieved from <http://www.nursecredentialing.org/Magnet>

Anderson, O., Davis, R., Hanna, G.B., & Vincent, C. A. (2013). Surgical adverse events: A systematic review. *The American Journal of Surgery*, 206(2), 253-262. doi:

10.1016/j.amjsurg.2012.11.009

Association of perOperative Registered Nurses. (2016). AORN hierarchy of evidence.

*Guidelines for Perioperative Practice*. Denver, CO: AORN.

Association of perOperative Registered Nurses. (2016). The revised AORN evidence rating model. *Guidelines for Perioperative Practice*. Denver, CO: AORN.

Brent, M. A. Z. (2016). OR specimen labeling. *AORN Journal*, 103(2), 164-176. doi:

10.1016/j.aorn.2015,12.018

Burgess, C., & Curry, M. P. (2014). Transforming the health care environment collaborative.

*AORN Journal*, 99(4), 529-539. doi: 10.1016/j.aorn.2014.01.012

Cabral, R. A., Eggenberger, T., Keller, K., Gallison, B. S., & Newman, D. (2016). Use of a surgical safety checklist to improve team communication. *AORN Journal*, 104(3), 206-

216. doi: 10.1016/j.aorn.2016.06.019

Castner, J., Ceravolo, D. J., Foltz-Ramos, K., & Wu, Y. B. (2013). Nursing control over practice and teamwork. *Online Journal of Issues in Nursing*, 18(2). doi:

10.3912/OJIN.Vol18No02Man03

Centers for Medicare and Medicaid Services (CMS). (2015). *Hospital-acquired conditions*.

Retrieved from [https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/HospitalAcqCond/Hospital-Acquired\\_Conditions.html](https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/HospitalAcqCond/Hospital-Acquired_Conditions.html)

Clark, C. M., & Kenski, D. (2016). Promoting civility in the OR: An ethical imperative. *AORN Journal*, *105*(1), doi: 10.1016/j.aorn.2016.10.019

Cochran, A., & Elder, W. B. (2015). Effects of disruptive surgeon behavior in the operating room. *The American Journal of Surgery*, *209*(1), 65-70. doi: 10.1016/j.amjsurg.2014.09.017

Communication [Def. 2]. (2017). In *Dictionary.com*, Retrieved from <http://www.dictionary.com/browse/communication?s=t>

D'Angelo, R., & Mejabi, O. (2016). Getting it right for patient safety. *American Journal of Clinical Pathology*, *146*(1), 8-17. doi: 10.1093/ajcp/aqw057

The Department of Health and Human Services Agency for Healthcare Quality and Research. (n.d.). *Universal Protocol for preventing wrong site, wrong procedure, wrong person surgery*. Retrieved from <https://psnet.ahrq.gov/resources/resource/3643/universal-protocol-for-preventing-wrong-site-wrong-procedure-wrong-person-surgery-->

The Department of Health and Human Services Agency for Healthcare Quality and Research. (2013). *TeamSTEPPS® 2.0 pocket guide*. Retrieved from <https://www.ahrq.gov/sites/default/files/wysiwyg/professionals/education/curriculum-tools/teamstepps/instructor/essentials/pocketguide.pdf>

The Department of Health and Human Services Agency for Healthcare Quality and Research.

(2017). *Teamwork perceptions questionnaire (T-TPQ)*. Retrieved from  
<https://www.ahrq.gov/teamstepps/instructor/reference/teampercept.html>

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics*, 5(1), 1-4. doi: 10.11648/j.ajtas.20160501.11

Garrett, J. H. (2016). Effective perioperative communication to enhance patient care. *AORN Journal*, 104(2), 111-120. <http://dx.doi.org/10.1016/j.aorn.2016.06.001>

Gaston, T., & Short, N. (2016). Promoting patient safety: Results of a TeamSTEPPS® initiative. *Journal of Nursing Administration*, 46(4), 201-207. doi:10.197/NNA.00000000000000333

Giltinane, C.L. (2013). Leadership styles and theories. *Nursing Standard*, 27(41), 35-39. doi: 10.7748/ns2013.06.27.41

Godlock, G. C., Miltner, R. S., & Sullivan, D. T. (2017). Deference to expertise: Making care safer. *Creative Nursing*, 23(1), 7-12. doi: 10.1891/1078-4535.23.1.7

Harvey, E. M., Wright, A., Taylor, D., Bath, J., & Collier, B. (2013). TeamSTEPPS® simulation-based training: An evidence-based strategy to improve trauma team performance. *Journal of Continuing Education in Nursing*, 44(11), 484-485. doi: 10.3928/00220124-20131025-92

Hicks, D. G. (2014). Standardization of tissue handling from the OR to the laboratory. *AORN Journal*, 99(6), 810-813. doi: 10.1016/j.aorn.2014.03.005

Holly, C. (2014). *Scholarly inquiry and the DNP capstone*. New York, NY: Springer.

Institute of Healthcare Improvement (IHI). (2017). *IHI triple aim initiative*. Retrieved from <http://www.ihl.org/Engage/Initiatives/TripleAim/Pages/default.aspx>

Joint Commission. (n.d.). *The Universal Protocol™ for preventing wrong site, wrong procedure, and wrong person surgery*. Retrieved from [https://www.jointcommission.org/assets/1/18/UP\\_Poster1.PDF](https://www.jointcommission.org/assets/1/18/UP_Poster1.PDF)

Joint Commission. (2013). *Sentinel events (SE)*. Retrieved from [https://www.jointcommission.org/assets/1/6/CAMH\\_2012\\_Update2\\_24\\_SE.pdf](https://www.jointcommission.org/assets/1/6/CAMH_2012_Update2_24_SE.pdf)

Joint Commission. (2015, August 28). *Benefits of Joint Commission accreditation*. Retrieved from [http://www.jointcommission.org/accreditation/accreditation\\_main.aspx](http://www.jointcommission.org/accreditation/accreditation_main.aspx)

Joint Commission. (2017). *2017 national patient safety goals presentation*. Retrieved from [https://www.jointcommission.org/npsg\\_presentation/](https://www.jointcommission.org/npsg_presentation/)

Kleiner, C., Link, T., Maynard, M. T., & Carpenter, K. H. (2014). Coaching to improve the quality of communication during briefings and debriefings. *AORN Journal*, 100(4), 358-368. doi: 10.1016/j.aorn.2014.03.012

Lee, T. (2016). Specimen labelling errors just don't cut it in the operating room. *ORNAC Journal*, 34(3), 14-20.

Li, A. (2013). Teamwork and climate and patient safety attitudes: Associations among nurses and comparison with physicians in Taiwan. *Journal of Nursing Care Quality*, 28(1), 60-67. doi: 10.1097/NCQ.0b13e318262ac45

- Lipshy, K. A. (2016). Invited response to Paull et al, errors upstream and downstream to the universal protocol associated with wrong surgery events. *American Journal of Surgery*, *211*(4), 827-828.
- Lloyd, S. T., D'Errico, E., & Bristol, S. T. (2016). Use of the Iowa Model of Research in Practice as a curriculum framework for Doctor of Nursing Practice (DNP) project completion. *Nursing Education Perspectives*, *37*(1), 51-53. doi: 10.5480/14-1364
- Makary, M. A., Sexton, B., Freischlag, J. A., Holzmueller, C. G., Millman, E. A., Rowen, L., & Pronovost, P. J. (2006). Operating room teamwork among physicians and nurses: Teamwork in the eye of the beholder. *American College of Surgeons*, *202*(5), 746-752. doi: 10.1016/j.jamcollsurg.2006.01.017
- McCambridge, J., Witton, J., & Elbourne, D. R. (2014). Systematic review of the Hawthorne effect: New concepts are needed to study research participant effects. *Journal of Clinical Epidemiology*, *67*(3), 267-277. doi: 10.1016/j.jclinepi.2013.08.015
- Melnyk, B., Fineout-Overholt, E., & Giggelman, M. (2016). A test of ARCC® model improves implementation of evidence-based practice, healthcare culture, and patient outcomes. *Worldviews of Evidence-Based Nursing*, *14*(1), 5-9. doi: 10.1111/wvn.12188
- Melnyk, B., Gallagher-Ford, L., & Fineout-Overholt, E. (2014). The establishment of evidence-based practice competences for practicing registered nurses and advanced practice nurses in real-world clinical settings: Proficiencies to improve healthcare quality, reliability, patient outcomes and costs. *Worldviews of Evidence-Based Nursing*, *11*(1), 5-15. doi: 10.1111/wvn.12021

- Mitchell, G. (2013). Selecting the best theory to implement change. *Nursing Management*, 20(1), 32-37. <http://dx.doi.org/10.7748/nm2013.04.20.1.32.e1013>
- Monahan, J. C. (2015). A student nurse experience of an intervention that addresses the perioperative nursing shortage. *Journal of Perioperative Practice*, 25(11), 230-234.
- Morath, J., Filipp, R., & Cull, M. (2014). Strategies for enhancing perioperative safety. *AORN Journal*, 100(4), 376-386. doi: 10.1016/j.aorn.2014.01.027
- Natafgi et al. (2017). Critical access to hospital use of TeamSTEPPS to implement shift-change handoff communication. *Journal of Nursing Care Quality*, 32(1), 77-86. doi: 10.1097/NCQ.0000000000000203
- National Institute of Environmental Health Sciences. (n.d.). *The NIH uses 3 exemptions*. Retrieved from [https://humansubjects.nih.gov/sites/hs/public\\_files/exemption\\_infographic\\_v4\\_hs\\_interne t.pdf](https://humansubjects.nih.gov/sites/hs/public_files/exemption_infographic_v4_hs_interne t.pdf)
- Paull, D. E., Mazzia, L. M., Neily, J., Mills, P. D., Turner, J. R., Gunnar, W., & Hemphill, R. (2015). Errors upstream and downstream to the Universal Protocol associated with wrong surgery events to the Veterans Health Administration. *The American Journal of Surgery*, 210(1), 6-13. doi: 10.1016/j.amsurg.2014.10.030
- Plichta, S. B., & Kelvin, E. A. (Eds.). (2013). *Munro's statistical methods for health care research* (6<sup>th</sup> ed.). Philadelphia, PA: Lippincott Williams & Wilkinson.
- Plonien, C., & Williams, M. (2015). Stepping up teamwork via TeamSTEPPS. *AORN Journal*, 101(4), 465-470. doi: 10.1016/j.aorn.2015.01.006

Riggall, V. K., & Smith, C. M. (2015). Creating a sustainable, interprofessional team training program: Initial results. *Clinical Nurse Specialist*, 29(3) 147-155. doi:

10.1097/NUR.0000000000000121

Roman, T. C., Abraham, K., & Deever, K. (2016). TeamSTEPPS in long term care—An academic partnership: Part I. *Journal of Continuing Education in Nursing*, 47(11), 490-

492. doi: 10.3928/00220124-20161017-06

Roman, T. C., Abraham, K., & Deever, K. (2016). TeamSTEPPS in long term care—An academic partnership: Part II. *Journal of Continuing Education in Nursing*, 47(12), 534-

535. doi: 10.3928/00220124-20161115-04

Sanner-Stiehr, E., & Ward-Smith, P. (2016). Lateral violence in nursing: Implications and strategies for nurse educators. *Journal of Professional Nursing*, 33(2), 113-118. doi:

10.1016/j.profnurs.2016.08.007

Schmidt, R. L., Messinger, B. L., & Layfield, L. J. (2013). Internal labeling errors in a surgical pathology department: A root cause analysis. *Lab Medicine*, 44(2), 176-185. doi:

10.1309/LMIENGRN0AE36NG

Sexton, M., & Baessler, M. (2016). Interprofessional collaborative practice. *Journal of Continuing Education in Nursing*, 47(4), 156-157. doi: 10.3928/00220124-20160322-03

Shams et al. (2016). How does TeamSTEPPS affect operating room efficiency?

*Otolaryngology—Head and Neck Surgery*, 154(2), 355-358. doi:

10.1177/0194599815620789

- Shirey, M. R. (2013). Lewin's theory of planned change as a strategic resource. *Journal of Nursing Administration, 43*(2), 69-72. doi: 10.1097/NNA.0b013e31827f20a9
- Shirey, C., & Perrego, K. (2015). Standardizing the handling of surgical specimens. *AORN Journal, 102*(5), 516.e1-516.e10. doi: 10.1016/j.aorn.2015.09.012
- Spiva et al. (2014). Effectiveness of team training on fall prevention. *Journal of Nursing Care Quality, 29*(2), 164-173. doi: 10.1097/NCQ.0b013e3182a98247
- Steelman, V. M. (2014). Excellence in perioperative management establishing a culture of safety. *AORN Journal, 100*(1), 1-3. doi: 10.1016/j.aorn.2014.04.010
- Steelman, V. M., Williams, T. L., Szekendi, M. K., Halverson, A. L., Dintzis, S. M. & Pavkovic, S. (2016). Surgical specimen management. *Archives of Pathology & Laboratory Medicine, 140*(1), 1390-1396.
- Stewart, G. L., Manges, K. A., & Ward, M. M. (2015). Empowering sustained patient safety: The benefits of combining top-down and bottom-up approaches. *Journal of Nursing Care Quality, 30*(3), 240-246. doi: 10.1097/NCQ.000000000000103
- Sweigart et al. (2016). Virtual TeamSTEPPS® simulations produce teamwork attitude changes among health professions students. *Journal of Nursing Education, 55*(1), 31-35. doi: 10.3928/01484834-20151214-08
- Teamwork [Def. 1]. (2017). In *Dictionary.com*, Retrieved from <http://www.dictionary.com/browse/teamwork?s=t>



- Tibbs, S. M., & Moss, J. (2014). Promoting teamwork and surgical optimization: Combing TeamSTEPPS with a specialty team protocol. *AORN Journal*, *100*(5), 477-488. doi: 10.1016/j.aorn.2014.01.028
- Van Wicklin, S. A. (2015). Back to basics: Specimen management. *AORN Journal*, *101*(5), 558-566. doi: 10.1016/j.aorn.2015.02.012
- Vertino, K. A. (2014). Evaluation of TeamSTEPPS® initiative on staff attitudes toward teamwork. *Journal of Nursing Administration*, *44*(2), 97-102. doi: 10.1097/NNA.0000000000000032
- Weld et al. (2016). TeamSTEPPS improves operating room efficiency and patient safety. *American Journal of Medical Quality*, *31*(5), 408-414. doi: 10.1177/1062860615583671
- Wheeler, D. S., Geis, G., Mack, E. H., LeMaster, T., Patterson, M. D. (2013). High-reliability emergency response teams in the hospital: Improving quality and safety using in situ simulation training. *BMJ Quality & Safety*, *22*(6), 507-514. doi:10.1136/bmjqs-2012-000931
- White, S., & Spruce, L. (2015). Perioperative nurse leaders implement clinical practice guidelines using the Iowa Model of Evidence-Based Practice. *AORN Journal*, *102*(1), 50-56. doi: 10.1016/j.aorn.2015.04.001
- Zhu, X., Baloh, J., Ward, M. M., & Stewart, G. L. (2016). Deliberation makes a difference: Preparation strategies for TeamSTEPPS implementation in small and rural hospitals. *Medical Care Research and Review*, *73*(3), 283-307. doi: 10.1177/1077558715607

**APPENDIX A. “SIGN OUT” CHECKLIST**

Surgeon Name: \_\_\_\_\_

Circulating Nurse: \_\_\_\_\_

Nurse Anesthetist and/or Anesthesiologist: \_\_\_\_\_

Was the “sign out” nurse initiated?    Y        N

Did the surgeon refuse to “sign out?”                    Y        N

\_\_\_\_\_        \_\_\_\_\_

(RN)    (CRNA)

Were surgical counts verified?        Y        N

Were specimens and handling instructions verified with surgeon?    Y        N        N/A

Were equipment problems addressed?        Y        N        N/A

Did surgeon verify recovery plan (i.e. whether the patient is to be admitted, will the patient go to recovery or ICU?)    Y        N

Was the nurse anesthetist and/or anesthesiologist made aware of recovery plan?    Y        N

Wound class verified?        Y        N

**APPENDIX B. LABORATORY AUDIT SHEET**

Dated:	Yes	No	
Timed:	Yes	No	
Formalin Time Listed:	Yes	No	N/A
Nurse Signature:	Yes	No	
Physician Signature:	Yes	No	
OR Room Identified:	Yes	No	