Prevention of Retained Surgical Items Through Education

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Table of Contents

Abstract

Incorrect surgical counts and retained surgical items are preventable errors that compromise patient safety. The literature suggests that surgical counts may be affected by multiple variables. This capstone project sought to exclusively explore the influence of education on incorrect surgical counts in the operating room. Thirteen surgical staff members at a Midwest regional hospital participated in this project. Every staff member possessed previous knowledge and experience with how counts were performed and have executed this task with great frequency. Reinforcement of pre-operative and post-operative surgical count education was conducted with the intended outcome of reducing incorrect count percentages. To assess the impact of this intervention, the capstone project analyzed incorrect count percentages prior to education and after education over an eight-week time frame. The deficit in knowledge was assessed by a six-question survey given to the general surgical team before the presentation. A post-education survey and gap analysis tool was given after the presentation to assess what the staff knew about the hospital's counting policy and procedure. Stagnant percentages before and after the education intervention revealed that education alone does not impact incorrect counts. However, findings do suggest that education increases a participant's confidence in their count policy and helps define clear roles of the team during the counting process.

Keywords: surgical, counts, retained items, operating room, education, variables, safety

Prevention of Retained Surgical Items Through Education

Retained surgical items and incorrect surgical counts happen every one in 10,000 procedures (Hempel et al., 2015). Incorrect counts have been prevented. As a result, this project aimed to decrease the odds for patients and improved the safety of the operating room through educating them to staff. A Midwest regional hospital with an alarming number of incorrect counts was aiming to decrease the number of incorrect counts. It was something the staff had voiced wanting to improve. Education was evaluated as a tool to improve the accurate surgical instrument counts in a Midwest regional hospital

Overview

Problem Description

Surgical counts are one of the most important safety measures to obtain for a surgical procedure. It is crucial incorrect counts are kept at a minimum. Due to human error incorrect counts may always be a part of surgery. During surgery there are an array of things happening at once: items being added to the field, surgeons discussing the process with residents, and asking for instruments, anesthesia monitoring the patient and may be asking for items such as drugs, and fluids, instrument representatives coming in an out to help assist with new equipment, etc. In consequence, the operating room can become a hectic and chaotic place making it easy for counts to become incorrect.

At a metropolitan hospital in the Midwest, preceptors are responsible for teaching new employees how to conduct surgical counts. This can lead to many different counting techniques, further contributing to an increase in counting errors. According to Fang et al. (2021), incorrect surgical counts have a high correlation to retained surgical items in patients. It is important to look at the factors causing incorrect counts. Fang et al. (2021) found the risk of an incorrect

count increased with emergency operations, addition or subtraction of surgical instruments or small objects from the field, prolonged surgeries, and time of the occurrence. Hempel et al. (2015) suggest providing education to staff on ways to communicate succinctly and effectively to keep counts efficient. Protecting and monitoring the surgical field is the number one priority of the scrub technician. Respectively, it is important to primarily educate the circulating nurses and scrub technicians who will be working together. This capstone project explored the following question: Among the general surgical team at a Midwest regional hospital, does reinforcing preoperative and postoperative surgical count education with a 30-minute in-service increase knowledge and confidence levels and improve incorrect count percentages over an 8-week time frame?

To measure this problem question, the capstone student looked at incorrect count percentages from the 8 weeks prior to the new education being implemented and for the next 8 weeks after the education was implemented. By capturing these numbers, the impact on education could be determined. Project participants were given a survey pre- and post-educational intervention to measure confidence and knowledge level with the counting policy. The data compiled through this capstone project was used to determine if education increased knowledge and confidence levels and decreased incorrect surgical counts.

Available Knowledge

Population

Reviewing the literature, the population being evaluated is the surgical teams involved with the incorrect counts and the surgical patients involved. Bubric et al. (2019) states the study was based on the care providers ability to report any incidents. This study evaluated 1824 reports of retained surgical items leading to incorrect counts (Bubric et al., 2019). Fang et al. (2021)

states the population contained 70 cases involving incorrect surgical counts and 250 control cases. Hempel et al. (2021) states 138 surgical cases were evaluated specifically looking at retained surgical item/ incorrect counts. Hibbert et al. (2020) examined 31 incident reports of retained surgical items which lead to incorrect counts. Kertesz et al. (2020) evaluated 150 cardiac surgery incident reports containing incorrect counts. All the populations studied in these cases were a mix of genders- male and female, some unknown. All authors stated age ranges varied and were wide due to the fact they involved staff ages and patient. The population in these studies included surgical patients involved and the surgical staff in the room during the incorrect count or retained surgical item.

Intervention

In the literature the goal was to discover what was causing the incorrect counts and is this problem reversible. The studies provided did not intervene to prevent incorrect counts, but rather collected data as to why these were occurring. The main intervention was data collection between a control group and experimental groups. As a result, Fang et al. (2021) stated the time of day, date of the surgery (Monday versus a Friday), type of surgery, and qualification of scrub nurse and shift personnel were all considered as interventions to be evaluated. Hibbert et al. (2020) used data collection as the intervention to discover causes of retained surgical items and incorrect counts. Burbric et al. (2020) used control groups in their interventions to assess cause for incorrect surgical counts. Using the control groups allowed them to investigate if certain changes to counting protocol or changing out less skilled staff for more skilled staff provided less incorrect counts.

Comparison

Many of the studies reviewed had control groups to evaluate cause for retained surgical item and incorrect counts. The control groups allowed for a baseline to change different factors to the surgery to focus on what causes incorrect surgical counts.

Outcome

Many of the outcomes noted different aspects causing incorrect counts. For example, Fang et al. (2020) investigated duration of surgery, type of surgery (such as emergency back door cases), change of staff during case, experience of staff, and if extra items were added to a case during the procedure. Hibbert et al. (2020) noted in the outcome showed surgical packs, drains, and vascular devices make up over two- thirds of the retained surgical items in the cases evaluated. Hibbert et al. (2020) examined the complexity of the case, use of non-standard equipment, or techniques also played into incorrect surgical counts and retained items. Bubric et al. (2020) stated dropping and losing an item was the biggest contributor to incorrect counts, failing to count an item during the initial count was the second largest reason for incorrect counts, length of the operation, packing items into a patient and not taking them out, and changes to a procedure during the case. Kertesz et al. (2020), noted intra-operative distractions such as music, interruptions, and cell phones/pager ringing etc. all contributed to incorrect counts. All these outcomes helped shed light to what causes an incorrect count, and how they can be prevented.

Timeline

In many of the studies specific timelines are not listed. Kertesz et al., (2020) noted the review performed took cases from the years 2011-2018. Bubric et al. (2019) states the surgical cases evaluated were from the years 2013-2016. Hibbert et al. (2020) utilized cases from the

years 2010-2015. Hempel et al., (2015) strictly looked at cases in 2014. Fang et al. (2021) stated data collected from cases performed in 2014-2019. As a result, many of these projects evaluated data over the course of years. This provided the ability to narrow down common factors through a large timeline.

Rationale

In the early 1990s, the University of Iowa developed a framework called the Iowa Model of Research-Based Practice to Promote Quality Care (Iowa Model Collaborative, 2017). This provided a guideline for clinicians to follow when using research to guide their patient care. White and Spruce (2015) examined this model specifically with perioperative nurses on how it could improve their practice. The model provided an opportunity to examine teach back lessons with the surgical team. The Iowa Model created an environment focused on organization and collaboration between peers (White & Spruce, 2015). This allowed for targeted knowledge and problem-focused triggers to be assessed for improvement.

The Iowa Model was used to guide this capstone project. It worked well for the facility because the general operating room nurses already had the knowledge base to perform counts and understand the protocol. This model guided nurses to look at what, when, where, and who caused the breakdown during a count to allow an incorrect count to happen. It also evaluated the developing solutions for the problem at hand. This provided valuable feedback to the team leaders as they went through the reeducation process and learned from their staff where deficits in knowledge, policy and procedure were occurring.

Purpose

The purpose of this project was to determine if the provision of preoperative and postoperative surgical count education improved incorrect surgical count percentages and

increased surgical staff knowledge and confidence at a Midwest regional hospital over an 8-week time frame.

Methods

Context

This capstone project took place in a metropolitan hospital located in the Midwest. The targeted participants included the general surgery team staff. This included the nurses and scrub techs. These individuals had degrees ranging from associates to master's degrees. There were approximately 45 members on the general team. The experience of these staff members ranged from new graduate to 15 or more years. Another group of people directly impacted by this project, but not directly involved included general surgeons, surgical oncologists, and trauma surgeons for this metropolitan hospital. Even though the surgeons were not involved in the project, they were informed the counts in their operating rooms were being monitored.

The organization is comprised of four individual hospitals and two specialty hospitals across the state of Iowa. The capstone project was performed at the main metropolitan hospital. The organization employed over 7,000 employees and 1,000 physicians and was one of Iowa's largest employers. The surgical team had over 300 employees collectively.

Intervention(s)

The intervention used in this capstone project was education. Reinforcement of pre-operative and post-operative surgical count education was conducted with the intended outcome of reducing incorrect count percentages. As discovered in the literature, the overall knowledge and experience of the surgical team member contributed to incorrect counts. Education also increased uniformity among the team and allowed for clarification in any gray areas that had

arisen in a case, such as how to count packed laps, how to count during change of staff, and what was the protocol if an item was lost.

First the capstone student obtained consent to perform capstone project with the surgical team from the clinical educator and director of the perioperative services each participant gave a verbal agreement to participate in the capstone project. The capstone student provided education in the form of a PowerPoint. The intended outcome of the education provided was to create a clearer understanding of how to prevent an incorrect count and how to reconcile an incorrect count. It was anticipated that provision of this education would lead to increased knowledge, confidence, and decreased incorrect counts.

The capstone student provided the educational intervention during the morning huddle of the general surgical team. Before the presentation, the capstone student handed out a five-question survey to each team member. Each team member filled out the survey, without writing their name on it, and placed it in a manilla envelope in the room. Once the survey was completed, the power point presentation began. The power point presentation was played on a projector for the staff to view as the capstone student discussed important aspects of each slide. Questions were answered as they arose. The presentation lasted 15 minutes and consisted of power point slides with explanations and a handout of the slides. The remaining fifteen minutes was used for questions, discussion amongst the team and a post-education survey.

The discussion included thoughts on the counting process and an open discussion for questions at the end. The presentation included going through every slide of the power point with the team and describing the information included in the slides. The surveys were collected by the capstone student. Each survey was entered into Excel and analyzed. All documents were housed in a manilla envelope in a locked cabinet in the perioperative educator’s office. The only people

who had access to the office were perioperative educator and director of the operating room. When the documents were longer being used, they were shredded.

Study of the Intervention(s)

To assess the impact of this intervention, the capstone project analyzed incorrect count percentages prior to education and after education. Incorrect counts 8 weeks prior to education and after education were evaluated. The percentages were then compared. To perform this analysis, the capstone student put all the surgical data into Excel to create percentages and means.

The deficit in knowledge was assessed by a six-question survey given to the general surgical team before the education intervention. A post-education survey and gap analysis tool was given after the intervention to assess staff knowledge about the hospital's counting policy and procedure. These two items helped the capstone student examine if the education materials were comprehensive enough, and if the staff's education had improved.

The last outcome evaluated was the confidence of the staff member. The capstone student was assessing to see if after education, did the staff feel more confident in their knowledge of the count protocol and policy. To assess this, the team members answered a question on their post-education survey stating whether after education they feel more confident in their abilities to use the counting policy and procedures. They answered yes or no questions and two Likert scale questions. The results were placed in Excel and the data were analyzed and compared to the staffs' pre-education surveys.

Measures

This capstone student sought to measure participant's knowledge before and after the education intervention. The first measurement tool was a six-question survey consisting of

yes/no questions and Likert scales. The data obtained from the survey enabled the capstone student to obtain baseline information related to knowledge and confidence and compared the same information following an educational intervention. The resulting data from the pre- and post-education surveys would be converted into dependent/paired sample t-tests. Cullen et al. (2018), stated clinical knowledge, perceptions/ attitudes, behaviors, outcomes, and balancing measures are all process measures that impact desired outcomes. Cullen et al. (2018), also stated observation of current practices was a key behavior impacting outcomes. As a result, the first survey constructed for this capstone project evaluated the team's knowledge for their facilities count policy.

After the presentation, a longer gap analysis survey created by the Association of perioperative Registered Nurses (AORN), was going to be performed to assess where gaps in the Midwest metropolitan hospital's policy may need to be revised. This analysis tool was created by the governing body of surgical nursing. The AORN gap analysis was peer-reviewed and evidence based. AORN has released numerous surgical journal articles over incorrect counts and provides many tools to help correct this problem. They also created an education system to help educate and prevent incorrect counts. Permission was granted by AORN to use this tool if the tool was not formally published. The gap analysis survey offered additional insight to the staff's knowledge of performing correct surgical counts. However, due to insufficient participation, this tool was not used.

After the education session, the general team filled out the post-education survey to assess new knowledge learned. The capstone student collected the number of general surgical cases and the number of incorrect counts that occur during those 8 weeks. This was calculated into a percentage and then compared to the previous 8 weeks before the education using the

Microsoft Excel. The numbers were compared to see if there was a decrease in incorrect count percentage.

The capstone student used this approach because it looked at the staff's level of experience, and their comprehensive knowledge. It looked at the count problem on a small section of the Midwest metropolitan hospital's large surgical team. This project could be applied to all the other teams if successful.

Analysis

The capstone student compared surgical count inaccuracies pre- and post-education. The student compared the pre and post-tests by graphing the data and finding the changes in the graphs. Based on the graphs in the results sections (Figures 1, 2 and 3), the student could deduce education improved confidence but not incorrect counts. The student used means and percentages to compare and contrast the compiled data. It was displayed in a table to show the difference before and after education was given.

One other descriptive data point was experience. This was being evaluated through the staff surveys. The data was collected and placed into a graph through excel. This data was useful in determining if experience played a role in incorrect counts.

The capstone student used a pre/post education survey to measure the education intervention. The information assessed in these surveys included participant confidence and knowledge about surgical counts. The answers collected from the pre/post education surveys were put into Excel and the mean was found. The data was then projected in two different column charts.

To ensure accuracy of the data, the capstone project had two data sets created for the pre and post education analysis. These four data sheets were checked manually to ensure correct data

collection had been obtained. If there was a decrease in incorrect counts, then the capstone project was successful. If the numbers stayed the same or increased, then the capstone project may have been unsuccessful and other factors besides education must be explored.

Once all the data was compiled and evaluated, it was presented to the staff in a summarized poster. The poster had the comparison graphs and a synopsis of the project execution and results. This ensured a clear explanation of if the outcome was met or fell short. The project helped determine if education was the reason the general surgical team was having an uptick in incorrect counts.

Ethical Considerations

The first ethical consideration was protecting patient identity. While patient interaction was not a part of this capstone project, protection of patient identity when gathering surgical count information was essential. All information used to discover percentages did not have any names listed on it. Participation in this capstone project was not mandatory. All participants were provided an agreement consent prior to participation and given the option to not participate. Surveys in this capstone project did not include any identifying information except for years of experience.

Approval through the institutional review board was obtained prior to implementation of this project. Data was protected with sealed manilla envelopes and shredded after key aspects, such as case numbers, years of experience, number of incorrect counts etc., were obtained.

Lastly, the capstone student and project mentor completed Collaborative Institutional Training Initiative (CITI) courses. This was done to ensure the student and mentor were educated on the ethics and behavioral principals that affected the project.

Results

The first outcome being evaluated was pre and post incorrect counts. Displayed below is the incorrect data for the two months prior to education (January and February) and two months Post education (March and April).

Due to insufficient data, t-tests and standard deviation were not performed in this project. However, the percentages of incorrect counts before and after education were calculated. As illustrated in Table 1, the results showed that before and after education incorrect counts still stayed at 0.899% but rounded to 1% in Excel. That data was for January. The rest of the months resulted in 0.912%, 1.1%, and 0.95%, respectively for February, March, and April. It was important to note that not just the general surgery operations could be singled out. As a result, these percentages and means are from the total number of surgeries performed at the main metropolitan hospital. Along with the counts being total surgical counts not just general.

Table 1

Surgical Cases

Month	Number of Cases	% of Incorrect Counts Per Month
January	778	1%
February	767	1%
March	877	1%
April	842	1%

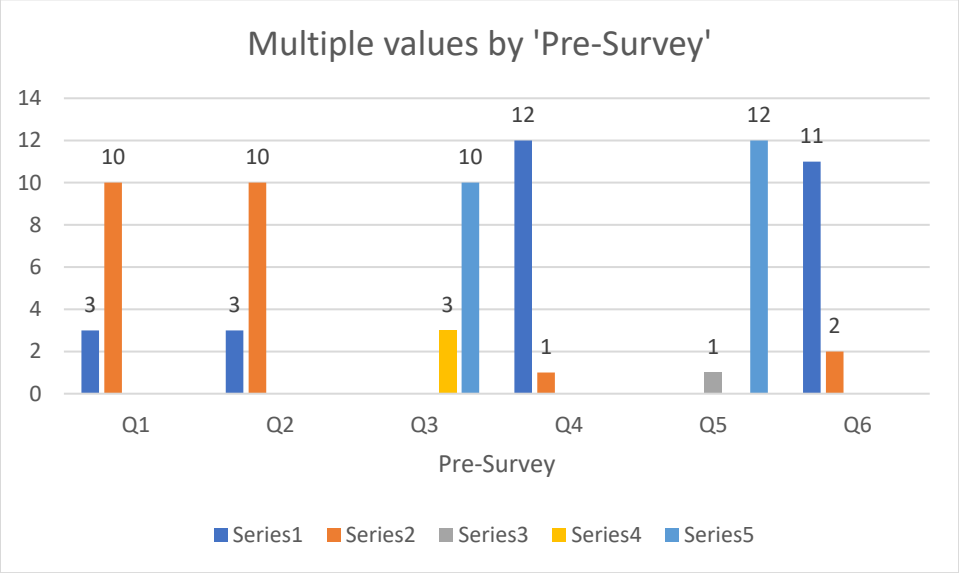
Note. Data represents the total number of surgical cases and total percentage of incorrect counts performed 8 weeks before education and after education.

The results of this project showed education as one individual factor did not affect incorrect counts alone. Out of 45 participants, data was collected from 14. Two of those participants were males and the rest were females. Experience was anywhere from new grad to 15 years or more of experience. After evaluating the surveys, it was deduced more people felt they no longer had a knowledge deficit after education. They were more likely to look at the

count policy if it was posted in operating rooms for reference. Participants felt they knew their defined roles for teammates involved in counting and felt they had a better grasp on the count policy itself. Lastly, the participants felt their confidence grew after education (see Figures 1, 2 and 3).

Figure 1

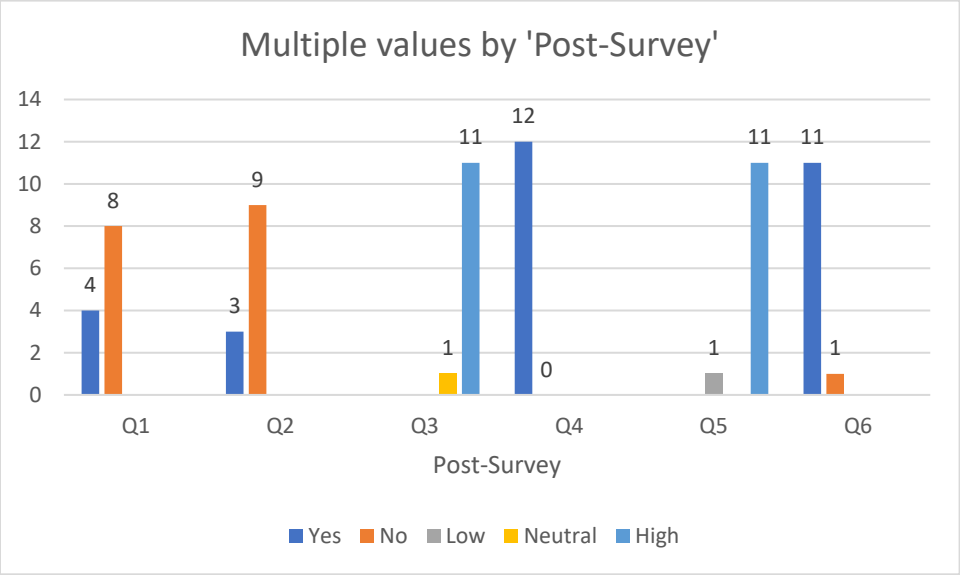
Pre-Education Survey Responses



Note. This figure represents the pre-education survey answers from participants. The horizontal legend is Yes-Blue, No-Orange, Low-Gray, Neutral-Yellow, and High-Light Blue.

Figure 2

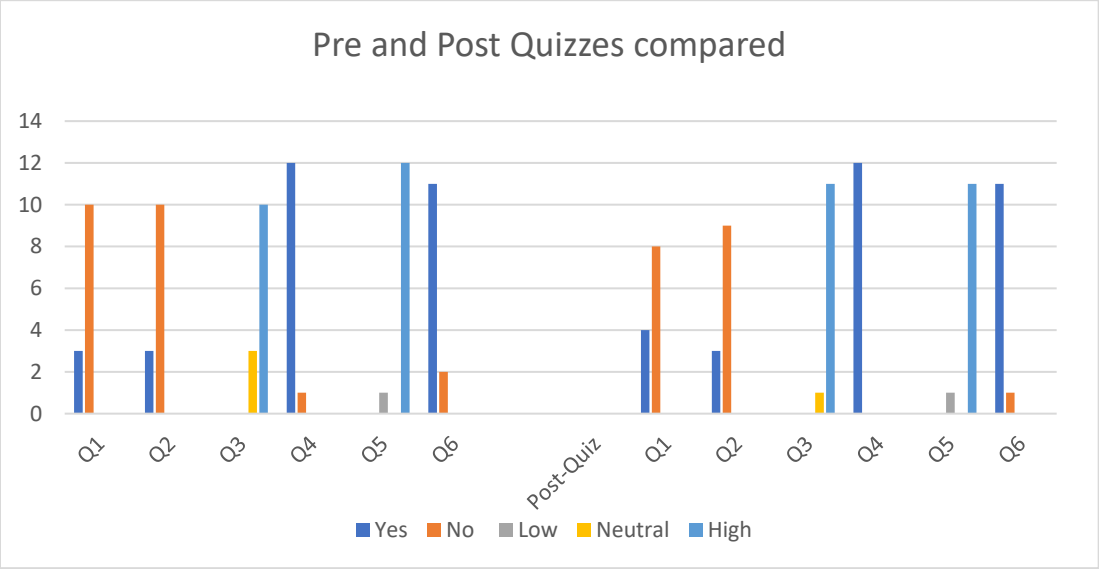
Post-Education Survey Responses



Note. This figure represents the post-education survey answers from participants. The horizontal legend is Yes-Blue, No-Orange, Low-Gray, Neutral-Yellow, and High-Light Blue.

Figure 3

Pre and Post Education Survey Responses



Note. This figure represents the pre and post education survey answers from participants. The horizontal legend is Yes-Blue, No-Orange, Low-Gray, Neutral-Yellow, and High-Light Blue.

Discussion

Summary

The goal of this project was to determine whether education as an independent variable affected incorrect counts and retained surgical items. Stagnant percentages before and after the education intervention revealed that education alone does not impact incorrect counts. However, findings do suggest that education increases a participant's confidence in their count policy and helps define clear roles of the team during the counting process.

Interpretation

After analyzing the peer reviewed data and the results of the project, incorrect counts are a multifaceted problem. Fang et al. (2021) stated the time of day, date of the surgery (Monday versus a Friday), type of surgery, and qualification of scrub nurse and shift personnel were all considered as interventions to be evaluated. After conducting this project, it was clear the most educated person in the room could still have an incorrect count. This leads the capstone student to believe staff changes, distraction, interruptions, and other factors affect incorrect counts and surgical items. It also provides backing to what the other researchers were saying, that changing out less skilled for more skilled and educated staff does not provide less incorrect counts.

Looking at this project, the capstone student believes even though the results showed education alone does not change incorrect counts possibilities, it still helps solve one piece of this problem. These results impact patients and operating room staff everywhere because it shines light on other factors that may be causing more frequent incorrect counts. Many factors such as suture size, timing of the case, number of people in an out of the case, problems and description of case change remains to be investigated as to reasons for incorrect counts. Overall, the capstone student understands retained surgical items and incorrect counts still have more progress to be made before this sentinel is completely erased. However, discovering that

education alone is not the answer nor the problem, is a step in the correct direction. This allows directors and educators of perioperative services to revamp their education on counts and look at more problem areas such as count boards, count sheets, number of people allowed to enter the room, volume of the music, how shift exchange counts are handled, etc.

This capstone project impacts patient outcomes and quality of care. This project attempts improves safety through better educating staff. The Iowa model is used as a guide to evaluate what, when, where, and who causes a breakdown in a system. By incorporating this model into the study the capstone student was able to improve patient safety and discover that multiple factors together cause incorrect counts.

Limitations

Limitations to this project include small samples size, being completed in only one facility, and it was not very generalizable. To the capstone student's knowledge there was no bias in the project. However, we must acknowledge that some of the participants may have had bias if they were upset with the current count policies or systems in the hospital.

Limitations in data did occur. The capstone student did not run a t-test, standard deviation, or use the gap analysis tool as projected. The t-test was not performed due to insufficient data. The standard deviation was not able to be computed. The gap analysis was not used due only providing improvements to the actual count policy not to the education on counts or policy.

Conclusion

The revised standards for quality improvement reporting excellence (SQUIRE 2.0) was used as a framework for reporting this project. This project provided many useful insights into

the surgical field and for the facility it was performed in. It allowed the capstone student and participants to see education is an important factor, but not the only factor causing incorrect counts. This project was very sustainable and is able to be replicated in other facilities. While the capstone student hopes continued research will build off of this project it is important to build from this and examine other factors that cause these sentinel events. The next steps the capstone student would suggest is looking at specific operations and a few distracting factors such as staff change, music, open heart surgeries, and Whipple procedures. Starting at higher risk and lengthier surgeries may shed some light on how to prevent incorrect counts and retained surgical items.

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